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VELVET



Frontispiece

VELVET

(1463Q)

PITMAN'S COMMON COMMODITIES
AND INDUSTRIES

THE VELVET AND
CORDUROY INDUSTRY

A BRIEF ACCOUNT OF THE VARIOUS
PROCESSES CONNECTED WITH
THE MANUFACTURE OF
COTTON PILE GOODS

BY

J. HERBERT COOKE



LONDON
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PREFACE

IN producing this little work on a very old Manchester, or perhaps one might say Lancashire, industry, I desire to record the large measure of assistance which has been accorded to me in my task by a number of old friends in various branches of the Velvet trade.

If it directs the attention of a wider public to the excellence of a British-made article, and thereby expands the interest in it, a useful purpose will be served.

I hope the result will be found interesting and instructive, and that it will be of benefit to all concerned in the industry.

J. HERBERT COOKE.

MANCHESTER.

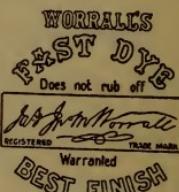
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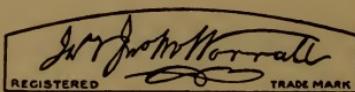
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THE VELVET AND CORDUROY INDUSTRY

CHAPTER I

ORIGIN AND HISTORY

VELVET may be briefly defined as a textile fabric having a short, soft, close pile or nap formed by erect threads on the face of the cloth. Its name is derived from the late Latin *velluetum* from *vellus*—a fleece, hairy, shaggy, evolved through the Ital. *velluto*, French *velours*, Sp. *velludo*. The German equivalent *sammet* probably derives from the gold embroidered tissues (*samite*) of remote times, which may have been interwoven in velvet as some specimens show.

For the purpose of this book we shall consider only that velvet and its kindred and allied tissues which is made from cotton as its raw material, as although silk and other fibres are employed in the manufacture of various styles and sorts of velvet, the classes of pile fabrics with which we are concerned are made entirely of cotton. These comprise weft pile articles of several sorts, and may be referred to as velvet, velveteen, velvet cord, corduroy, fustian, moleskin, beaverteen, barracan, imperial, fiveshaft, satintop, bedford cords, etc. Strictly speaking, some of the last classes may not be quite accurately included in the weft pile group, whilst others such as barracan, imperial, fiveshaft, satintop, are not woven with pile races at all. They are, however,

regarded as kindred fabrics of one family, and may be summed up under the classification of fustians. This is the older designation for the parent fabric from which the various subdivisions have developed in those evolutionary processes which we shall briefly trace out.

Velvet pile fabrics have a very remote origin, and are certainly amongst the most ancient forms of textile art. The making of velvet seems to have originated, like many other arts, with the Chinese at a date very remote from the Christian era. There are in existence specimens of velvet, probably of cotton, believed to date back to some remote time, hazarded even as far back as 2000 B.C.

Persia took an important share in the production of velvet at a less remote period, as the large collection of velvet fabrics of Persian origin or influence in the Musée Historique de Tissus at Lyons can testify. Whatever conjecture may do in regard to fixing its extreme antiquity, there is evidence showing the use of velvet in the very early years of recorded history. From the remote East the use of velvet spread through Asia, Babylon, Palestine, Asia Minor, and round what we now call the Levant. That cotton played its part in those remote times is evident as Herodotus, writing some five centuries before the Christian era, mentions what is accepted as a reference to the cotton plant when he speaks of "trees bearing fleeces as their fruit." As the "Tyrian purple" already had a reputation in 1500 B.C., it is probable that the Phoenician dyers of Tyre and Sidon had some hand in the development of velvet.

In their raids into near Asia, the conquering Roman armies helped the westward movement of the textile arts around the Mediterranean Sea. What is known to us as fustian is said to have taken its name from the

cloth manufactured by the Arabs at El Fustade, a suburb of Cairo.

The Arabs at the height of their industrial development in Spain made weft pile fabrics at Granada, and the manufacture of various styles of cotton pile fabrics has long been carried on at Barcelona. Fustians and corduroys were being made at Antwerp and Ghent when these cities formed part of the Spanish Netherlands, and very likely the knowledge of the arts and manufacture had found its way there through the Spanish occupation, though, as we shall see elsewhere, the spreading and development of the textile arts was concurrently proceeding through Sicily, Italy and France, northwards.

The great movements of the Crusades, bringing back in their returning tides the knowledge of those Eastern lands and the arts and crafts practised in them, educating those who participated in them as to textiles hitherto unknown, helped the diffusion of those arts, much as in earlier times the victorious Roman armies had done in their penetration of the nearer East. The peculiar properties of velvet, its rich deep colours, with its sheen and lustre consequent on the depth of pile, its soft touch and the varied play of light on its myriad points of pile, made it a worthy object for the sumptuous and magnificent display of the rulers of Imperial Rome.

The same spirit and desire claimed it later in the realm of ecclesiastical adornment, where we find the designers and craftsmen of the Italian Republics devoting themselves to all classes of pile fabrics for this purpose. Equally did the richness and beauty of the fabric fit well with the pageantry and display of the Age of Chivalry, and the sumptuous wardrobes of the royalties, and the grandees of mediaeval times.

In those early days, Asia Minor was a highly developed country, possessed of extensive arts and manufactures, and these found their way through the various agencies we have mentioned into Western Europe. The great maritime trade of Venice with Asia Minor and the Eastern Mediterranean helped to settle the manufacture of velvet in that important trading centre. Probably by this channel and the conjunction of trade routes with the maritime ramifications of Venice, the influence of Persian design in velvets, already noted, made itself felt in the Venetian developments of styles and designs.

By this time the supremacy of Venice on the sea had become so far reaching that her maritime trade, carrying her beyond the limits of the Inland Sea out into the Western ocean, brought her into touch with Western Europe—and the metals and wools of England now contributed to the prosperity of the City of the Doges. M. Jusserand in *English Wayfaring Life in the Middle Ages* tells us that the Venetian Republic sending out its fleet, or "Galleys of Flanders" as it was called, brought to England cotton from Egypt—although there is no record of cotton manufactured in England as early as the fourteenth century. Cotton seems to have been known in England earlier than this, but no manufacture of it is recorded until a later time. At this period the Venetian Republic maintained a representative at the thriving port and manufacturing centre of Bruges. This same fleet took back to Venice, amongst other English products, the coarse woollen cloths amongst which may have been those surmised to have been then known as fustians, though as yet not made of cotton. Concurrently with these developments Sicily also, industrially developed, was passing on its manufactures through the Italian Republics of Lucca, Florence, Genoa, to the towns of Northern Italy

—some of which have long been concerned in the manufacture of velvet or fustian fabrics.

Genoa has given its name to the “Genoa Back” or “Twill Back” weave, which has been one of the important factors in the perfecting of cotton velvet into the beautiful fabric as we know it to-day ; and in the manufacture of corduroys the “Genoa” and the “Double Genoa” have long been names for styles well known in the fustian trade.

From the Republics of Italy the knowledge and the use of velvet travelled on through Avignon, the city of the Popes, to the budding silk metropolis of Lyons, and to Paris ; and on through Northern France to Flanders and the Netherlands, where at Bruges and Ghent we find the arts of weaving progressing.

There is reason to believe that cotton textiles were imported from Spain in those early times, and that “Fusti” was amongst them—this is probably one origin of the term fustian. However the term may be derived, and it occurs in many languages—LL. *fustaneum*, *fustanum*, Italian *fustagno*, O.F. *fustaigne*, F. *futaine*, Med. E. *fustane*, Chaucer, *fustyan*, Sp. *fustan* *fustania*—the article, whether originally Old English woollen, later woollen and linen, linen and cotton, and finally cotton, was known as a material for the lower classes in the fourteenth century.

The turbulent times of the religious persecutions of the Huguenots, the Revocation of the Edict of Nantes by Louis XIV in 1685, and the excesses and cruelties of the Duke of Alva in the Spanish Netherlands, all combined to break up the industrial communities of this corner of North-Western Europe, and skilled artisans availed themselves of the religious freedom and security offered them on this side of the North Sea, and the inducement given to them to settle in the

textile districts of England (which were already beginning to develop), and where the infant industry was already a sturdy bantling. It is said that 70,000 Huguenot refugees settled in Great Britain as a result of these political and religious disturbances on the other side of the Channel.

Development in Lancashire and Manchester. Manchester is credited with having offered inducements to these fugitive artisans to come along and help the growth of this infant trade, and it is probably due to this international admixture that the textile sapling of those early years has become the sturdy tree of these modern times.

As far back as the fifteenth century there had been carried on in the vicinity of Manchester and in South East Lancashire generally the manufacture of fustians, but it appears that these were a combination of wool and linen, as linen warps were imported from Ireland for this purpose. Bolton, Leigh, Bury, and eventually Oldham and Royton, all carried on this early fustian manufacture.

It was, however, some time later in the sixteenth century before cotton began to take its place in the making of fustians, consequent on the importation of the new textile fibre of cotton from Smyrna and the Levant by the East India Company.

By the middle of the sixteenth century Manchester had become well-established in the fustian trade, obtaining the so-called "cotton-wool" in London and manufacturing it into fustians, dimities and kindred articles, and returning it to London "where the same is vented and sold and not seldom going into foreign parts."

A London merchant, Lewis Roberts, in his very interesting *Treasure of Trafficke*, makes some shrewd

observations as to the growing cotton trade, and the reputable connection which Manchester had already built up for its fustians and other productions. He, too, refers to this part-linen cloth, with which the Irish linen yarn was closely associated. Evidently the original fustian was a textile of ancient origin, as Chaucer refers to it in his *Canterbury Tales*—

Of fustyan he wered a gipoun.

Shakespeare gives plenty of examples, showing he was acquainted with both fustian and velvet. In *Measure for Measure* he makes Lucio say—

Thou art the list, and thou the velvet: thou art good velvet.

In *Love's Labour's Lost*—

I had as lief be a list of an English kersey as be piled, as thou art piled, for a French Velvet.

In *The Taming of the Shrew*—

A silken doublet! a velvet hose! a scarlet cloak! and a copatain hat!

In *All's Well that Ends Well*—

With a patch of velvet on's face, whether there be a scar under't or no, the velvet knows, but 'tis a goodly patch of velvet.

In *Twelfth Night*—

And saw myself unbreech'd in my green velvet coat.

The excellences of velvet were not lost on the observant Mr. Pepys, who notes in his *Diary*—

This morning was brought home my new velvet cloak, that is lined with velvet, a good cloth the outside—as ever I had in my life.

Sumptuary Laws in the time of Queen Elizabeth and King James specified fustian as wear for servants. It is evident from references to fustian in Shakespeare that this was the material used for servants' livery. For example, he makes Grumio say in the *Taming of the Shrew*—

The serving men in their new fustian.

More recently the hero of *Tom Brown's Schooldays* in his encounter with the keeper refers to his velveteen jacket in what the keeper deemed a derogatory manner. The suitability of "velveteens" for the dress of his calling has commended itself for hard wear and utility to successive generations of keepers as one may see in the countryside even to-day. This digression only serves to trace the evolution of both velvet and fustian, and the keeper's resentment is perhaps an echo of the mediaeval distinctions of the Sumptuary Laws.

Leaving the composition of fustian in the Middle Ages as a debatable point, it is evident that by this time "Manchester Cottons" were really made of cotton, and although there is evidence of cotton being known before that time, it is not clear that it was employed to make the whole of the fustian fabric much before the early part of the seventeenth century. With its own developments, probably supplemented by French and Flemish weavers too, Manchester was fairly launched on its career of fustian manufacturing before the seventeenth century opened, and from that time on the progress and development of fustian has been steady and continuous—although the evolution of cotton velvet as a fine and even superfine dress fabric only dates from what one may call modern times.

In the early days of the domestic cotton manufacture there was probably a transition from the woollen-linen manufacture, carried on by farmers in their isolated farms and villages, to the cotton from which fustian began to be made in entirety. We find in local chronicles reference to fustian farmers—farmers combining agriculture with fustian weaving. Later, there grew up a class of fustian masters who supplied this new material—cotton—from the merchant to the weaver and got it woven for him. By the middle of the eighteenth

century the fustian masters were a recognized class in the manufacturing districts of Lancashire ; the custom seems to have been for these fustian masters, both in Manchester and in the surrounding towns, to give out warps to the weavers, who either obtained their own weft or received it from the merchant, wove their pieces of fustian and brought them into Manchester, where they were paid for their labour and such part of the material as they supplied. Sometimes the spinning was done in the home of the weaver.

The grey pieces were then put out to be dyed or printed by the merchants, who carried the finished product round the country on packhorses, selling to the shopkeepers as they went along. Many of the present manufacturing towns of Lancashire, which were villages or hamlets in those distant days, are recorded as being occupied in these trades, making what are variously described as fustians, thicksetts, cotton ribs, cords, velverets, velveteens, barracans or barragons, and styles of which the names have passed out of recognition. Royton, Crompton, Oldham, Rochdale, Bolton, Leigh, Ashton, all seem to have shared in this fustian trade. The business, however, must have been developed with difficulty in that comparatively primitive era, before the mechanical age, when the power loom and spinning mule only existed in the minds of those restless inventors who, later, were destined to give Lancashire such a wonderful start in her cotton manufacturing—giving her a lead in that supremacy, which it is hoped she may continue to retain.

Nevertheless, primitive though the organization seems to us, there are records of exports by Manchester merchants of fustian articles to Italy, Germany, and North America by the middle of the eighteenth century. However, the end of the eighteenth century seems to

have had a bad time for the fustian trade, and the domestic or hand-loom age seems to have been nearing its end. It passed through a period of depression from which it was only to emerge when the power loom gave it a new lease of life. There was great displacement of labour and consequent distress during the change over from the hand loom to the power loom. A chronicle of that time records that "X— died,— he was a fustian manufacturer, but of character contrary to most, for he was a sincerely good man." Rather a reflection on the character of the fustian trade in the hand loom era, though hard things have been said about it in more recent times ! Pitt tried his hand at raising revenue by imposing a fustian tax about that time, but it aroused such opposition in Lancashire that it had soon to be withdrawn. History is always repeating itself, but let us hope that Pitt's modern successors will not seek to fill our depleted national coffers by any further attacks on the fustian trades. Some of the present-day methods of restricting and controlling necessary dyestuffs and kindred products, whilst more insidious, may be just as harmful to this ancient trade as Pitt's direct method, but the indignation of Lancashire may not be able to make its weight felt quite so effectively now as it did then.

CHAPTER II

DESCRIPTION OF ARTICLE AND GEOGRAPHY OF MANUFACTURE

Description of the Article. Fustian has retained its characteristics of hard wear and utility, and whilst comprising a number of articles of varying degrees of fineness, the heavy velveteens, corduroys, moleskins, beaverteens, imperials, diagonals, etc., included under this designation, are all strong fabrics made of stout yarns, and are destined mainly for men's wear.

The finer side of the pile fabric work, comprising the velvet pile articles, velvets, velvet cords, hollow-cut cords, and fine velveteens, as already stated, is a growth of modern times, due to the finer spinning and more efficient weaving, expert cutting and improved dyeing, all of which are developments mainly of the latter part of the nineteenth century. All of them owe their origin to their fustian forerunner, but have progressed out of recognition through improved technique. Naturally, the ideal aimed at is the imitation of the real Lyons silk velvet, and with the employment of high-grade Egyptian cotton, finely and skilfully spun for the warp, and for the weft long stapled American cotton, its smooth and silky fibre and velvety touch, and so suitably spun that it opens out in process into the lustrous soft pile characteristic of the best quality of cotton velvet, the imitation has created an unique place for itself in the dress fabrics of the world.

Geography of the Manufacture. The manufacture of the grey cloth which ultimately forms the much admired velvet garments of Regent Street, the Champs Elysées or Fifth Avenue, not to mention other centres of the

world's fashion, is carried on largely in Oldham, and to an important extent in Preston, Bolton, Bury, and some other parts of South East Lancashire.

Bolton, as we have seen, has been associated with its original ancestor—fustian—for several centuries past, but does not now stand as much at the head of velvet production as does Oldham, whose looms produce fabrics of the highest class and grade. The industry is and always has been very much sub-divided, and whilst necessarily associated with the cotton trade as a whole, requires a degree of specialization which makes the various elements of it generally a class apart from the bulk of Lancashire's staple trade.

Modern Velvet Manufacture. Having given some attention to the historical side of velvet and fustian, we can now consider its manufacture. We may commence by briefly enumerating the various processes necessary to convert the raw material—cotton—into the rich and lustrous fabric of a reigning beauty's gown, and subsequently we can consider these operations in more detail.

The cotton, fine Egyptian or perhaps the best growths of American for the warp, spun to a degree of perfection which will guarantee a warp yarn free from faults and capable of standing the strain of weaving, is to be associated with a high grade American weft, spun so as to be soft and silky. These are suitably combined in the best qualities of velvet. When woven the pieces are taken over by the Manchester merchants, who are really convertors of the article and who arrange the processes of manufacture subsequent to the weaving.

These commence with stiffening the back of the velvet so that it can be stretched rigidly on the velvet cutting frame, leaving the face of the velvet so that the

knife will readily cut the loops, tunnels or races, which eventually form the pile. This process is generally supplemented by liming the face of the velvet so as to retain an edge on the cutting knife. Cutting is an art which requires great manual dexterity, as, if the pile is not properly formed at this stage, nothing can be done in the subsequent processes to redeem the failure, and the piece will be spoiled.

Afterwards the pieces are sent out for dressing—an initial stage of the dyeing processes—in which the pile is prepared, and subsequently for the first time it assumes the appearance of real velvet. After dressing, brushing, etc., and repeating these processes, according to the quality, several times, the piece is ready for bleaching and dyeing, and the merchant sends it to the dye-works best equipped for the class of work he requires. All velvets of good quality should certainly be dyed by the fast dye process, as this ensures the dye being so fast that it will not rub off as was the case some years ago.

Finally, after dyeing, an addition is made to the lustre by means of waxing, finishing, and in other ways increasing the natural sheen of the cotton, and the piece is ready for final return to the merchant's warehouse.

The distribution of the finished product calls for specialized organization, and will be dealt with later on. This rough outline will serve to show how subdivided the industry has become, each operation being carried on by specialists in their respective branches, and all linked together by the merchant who finally places the completed fabric in the markets of the world.

How far the exigencies of world trade in the future will tend to modify the situation remains to be seen : the competition of other countries remained for a while

after the Great War an almost negligible factor, but is now beginning more seriously again, and may force a re-arrangement of the various branches, bringing them closer together, in order to effect economies and increase efficiency. The tendency in the past has been to extreme individualism, and whilst this may have had advantages in its time, it is quite clear that in the twentieth century much more may be effected by co-operation than was ever thought possible in the past century.

Having given a general glance at the broad features of velvet and corduroy manufacture, it will be well to consider the individual processes in more detail.

CHAPTER III

MATERIALS—COTTON—SOURCES OF SUPPLY— CULTIVATION

Velvet Cotton. For that purpose we will go back to the beginning of things—the raw material, cotton, or to give it its scientific name, *Gossypium Barbadense*. This has been dealt with fully in other text-books, and it is not necessary to go into it more deeply than to consider the sorts of cotton which concern the velvet trade. It suffices to say that, whilst cotton is grown in most of the tropical and in some of the sub-tropical portions of the world, we, as velvet manufacturers, are chiefly interested in two main sources of supply—the Southern States of North America and Egypt. From these two sources we obtain cotton with a fibre of $1\frac{1}{4}$ to $1\frac{1}{2}$ ins. in length, but this long staple cotton is only obtainable in limited quantities, and at present cannot be grown elsewhere, so that in common with other Manchester cotton manufacturers the velvet trade views with concern the question of its future supply of raw material. It is hoped that the valuable pioneer work of the British Cotton-growing Association will eventually relieve this anxiety by assisting the growth in large quantities of long staple cotton in those promising sections of the British Empire where experiment has shown that the right qualities of velvet cotton can well be grown. Such countries comprise, amongst others, Nigeria, Uganda, Nyassaland, Mesopotamia, South Africa and Australia. In Nigeria an improved variety of American cotton has been successful. In the small country of Nyassaland a quantity of cotton of the silky characteristics so necessary for velvet production has

been grown, but the effect of the Great War bore hardly on that small country. India, though a large grower of cotton, does not produce a crop at all suited to the needs of velvet production, being of short staple, and only a small proportion of it finds its way to Lancashire for any requirements of our staple industry.

It is an interesting fact to note that particular types or breeds of cotton, hybridized with other cottons in order to produce improvements in yield, staple, strength or resistance to attacks from pests or climate, as sought for and developed in Egypt for example, reach a certain perfection in these attributes, and then gradually fall away and deteriorate. Points concerning fertilization, with these objects in view, are continually engaging the attention of agriculturists and experts in Egypt, in order to evolve suitable types for the country. As a "type" of cotton quickly attains its zenith and then begins to deteriorate and in the course of a few years is displaced by another new growth, evolved as the result of experiment by the agricultural experts, many different sorts have been created to meet these needs, and some well-known ones, bearing the name of the producers, may here be mentioned, such as Abassi, Gallini, Nubarri, Jannovitch, Sakellarides, etc., though they continue to be superseded by qualities more virile and for a period immune to the attacks of pests, etc., until they in their turn have to follow their predecessors.

The West Indies formed one of our earliest sources of supply for long staple cotton. Columbus found cotton growing there, and Cortez found the Aztecs of Mexico employing cotton in their garments. It has been stated that the Island of Barbados was the original home of the cotton plant, and certainly the long stapled variety—*Gossypium Barbadense*—exhibiting the longest

staple, thrives in that small island. Experiment with other sorts has shown that the quality and length of staple have improved when taken back to Barbados. The area available for cultivation in the West Indian

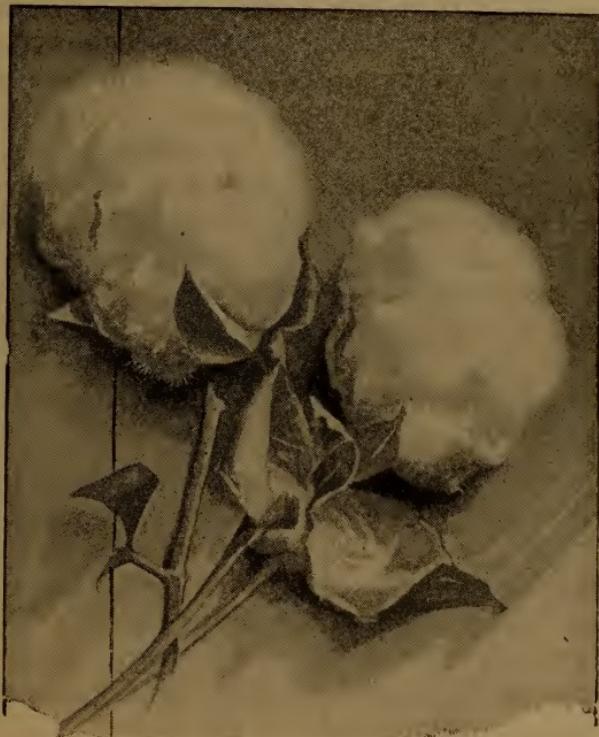


FIG. 1
VELVET COTTON

Islands is, however, obviously very limited. Generally speaking, the long-stapled varieties find their successful homes in the alluvial valleys of rivers subject to overflowing, as in the Mississippi and the Nile. The deposit left on the land by these overflowings forms the best soil

for the production of those long stapled varieties, containing the elements best suited for the requirements of velvets ; and as the great rivers of Mesopotamia present similar characteristics, it is hoped that an assured supply will soon be available from that country. The quality grown in West Africa, where the plant is indigenous, is also of good staple, but difficulties of transport make that as yet an inadequate source of supply.

At present the supply from existing cotton fields is precarious, and with the sensitive nature of the plant and the vagaries of climate (which are not confined to Lancashire alone, as is popularly supposed) a disaster may at any time fall upon the cotton industry. The good qualities which mainly interest us are preyed upon by armies of pests, as well as suffering peculiarly from climatic troubles. Of these pests the bollweevil and the bollworm are probably the most destructive, and the ravages of these and other insect pests are responsible for much deterioration and destruction in various cotton fields. Having survived these the crop duly ripens and is eventually picked. This continues to be one of the few hand processes which as yet it is not found possible to displace effectively by mechanical means. With the ginning or separating of the seed from the fibre we are not concerned in detail, and after this operation, the baling and transportation to the ocean port, quite frequently in indifferently made bales, follows and the ocean voyage brings our cotton eventually to Liverpool. Much the same routine is followed in the picking, baling and transportation of Egyptian cotton, a large quantity of which, however, comes by direct steamer to Manchester.

In tracing the early development of velvet, and when comparing the primitive implements of the spindle and distaff of remote times which had to serve for so

many generations, or even the more advanced spinning wheel and bobbin of the Middle Ages and later, with the smooth precision and perfect work of the spinning mule, it is not difficult to realize that no great advance in an article necessarily of fine texture should have been made until the era of mechanical spinning had advanced the making of fine velvet yarns to a point of considerable perfection. The handloom weaver of a century and a half ago had similar disabilities ; the heavy cloth of the fustian family or the velveteen of those days required the advent of the power loom to develop it commercially and to evolve that evenness of texture, regularity of output, and freedom from blemishes and faults in the tunnels or races, necessary to the production of a fine velvet.

CHAPTER IV

PREPARATION—SPINNING AND WEAVING

Preparation and Spinning. However, having safely transported our bales of snow-white, long-fibred American or our creamy Egyptian¹ to a Lancashire mill, we decide upon the particular blending which gives the best results when turned into yarn, and we proceed somewhat as follows: After opening the cotton bale we pass it through the bale breaker, the Crighton opener, and passing thence through the hopper feeding machine on to the scutching machinery, the object of each operation being to break up the cotton into small particles, and at the same time by the aid of ingenious devices, to extract as far as possible the cotton seeds, leaf and other impurities which we still find clinging to the cotton. The lap machine now comes to our aid and converts the mass of cotton into a nice even roll or “lap.”

These laps are afterwards taken to the carding engine and drawn over cylinders clothed with finely pointed specially prepared and shaped steel wire, the object of this and subsequent machines being specially to lay out the fibres in a parallel or “combed” style, and at the same time by an ingenious method extracting what dirt and other imperfections are still present in the cotton.

We are now ready for the final operations in the making

¹ *N.B.*—The Brown Egyptian, offering such a contrast to the White American, is not now produced in good quality cotton as formerly. This leads back to some interesting points connected with the stamina, so to speak, of Egyptian cotton, already referred to on page 16.

of our cotton thread, and for the purpose of reducing or attenuating the diameter of the rove or hank as it passes through the stages known as drawing, intermediate, and roving, before being passed forward to the final process of the actual spinning of the thread.

We next see the ingenious mule spinning frame (Fig. 2), drawing out on its thousand or more spindles the fine delicate yarn made of the strong, wiry, creamy-brown Egyptian cotton, destined to form the foundation of our high-class velvet qualities. As we watch the spinning of these thousand spindles on their carriages, which almost humanly check their progress, halt and run back only to make a fresh dart forward, elongating and twisting all the time, we realize what our velvets owe in their start in life to the technique and efficiency of the velvet yarn spinner.

For the general run of good quality velvets, yarns of two-fold sixties counts or two-fold seventies are usually employed for the warp, and for the weft single thread forties counts, up to sixties would generally serve. Regard must be paid to the eventual waste which would result from the employment of inferior cotton, not only in the failure to produce the soft velvety pile always aimed at, but also in the loss of material in the dozen or more operations which have to follow that of weaving. All these considerations combine to decide the quality which has to govern the preparation of the yarn for velvet.

Hard things have been said of the climate of South East Lancashire, but the humidity caused by the precipitations of clouds, unable to carry their moist burdens over the Pennine backbone, has for generations assisted this elongation and twisting so essential in the production of our velvet yarns.

Having now carried our raw material to the yarn

stage, we will next examine the combination of these threads into the various styles of cloth, as dictated by the varied requirements of the world.

Weaving. The actual making or building up of a fabric such as is the subject of this book is a technical and detailed process, and we will now follow it on, employing only such technical detail as may be necessary. A fabric of this sort is essentially one that pays for itself in material used, and no amount of careful work will make good velvet out of inferior yarns, but, quality neglected, the result will be without doubt unsatisfactory. A cloth which depends on the warp threads to hold the effective weft forming the pile (which in its turn, unlike other plain fabrics, does not help the warp) is a matter of evolution not only in the successful making as far as the weaving and its processes are concerned, but in obtaining and having made exactly in the right way the right yarns from the right quality of cotton.

The warp for weaving velvet and kindred fabrics, as we have seen, is spun from a superior quality of American or Egyptian cotton, and the yarn from which the warp is made must be of the best obtainable variety of cotton and yarn. In the lighter and medium qualities and weights of velvets the warp will very frequently be found to be of single yarn, spun on the ring spinning frame, as, of the quality used, this will be strong enough up to quite moderate weights, but as the cloth comes to be made heavier and heavier the limit of the weaving strength of the yarn is reached, and recourse must be had to what is technically termed "two-fold" warp, which means that each end or thread of the warp is made from two ends of yarn twisted together, and, in this case, very frequently mule spun yarn is used, the resultant yarn being far more than doubled in strength, and is more level and regular.

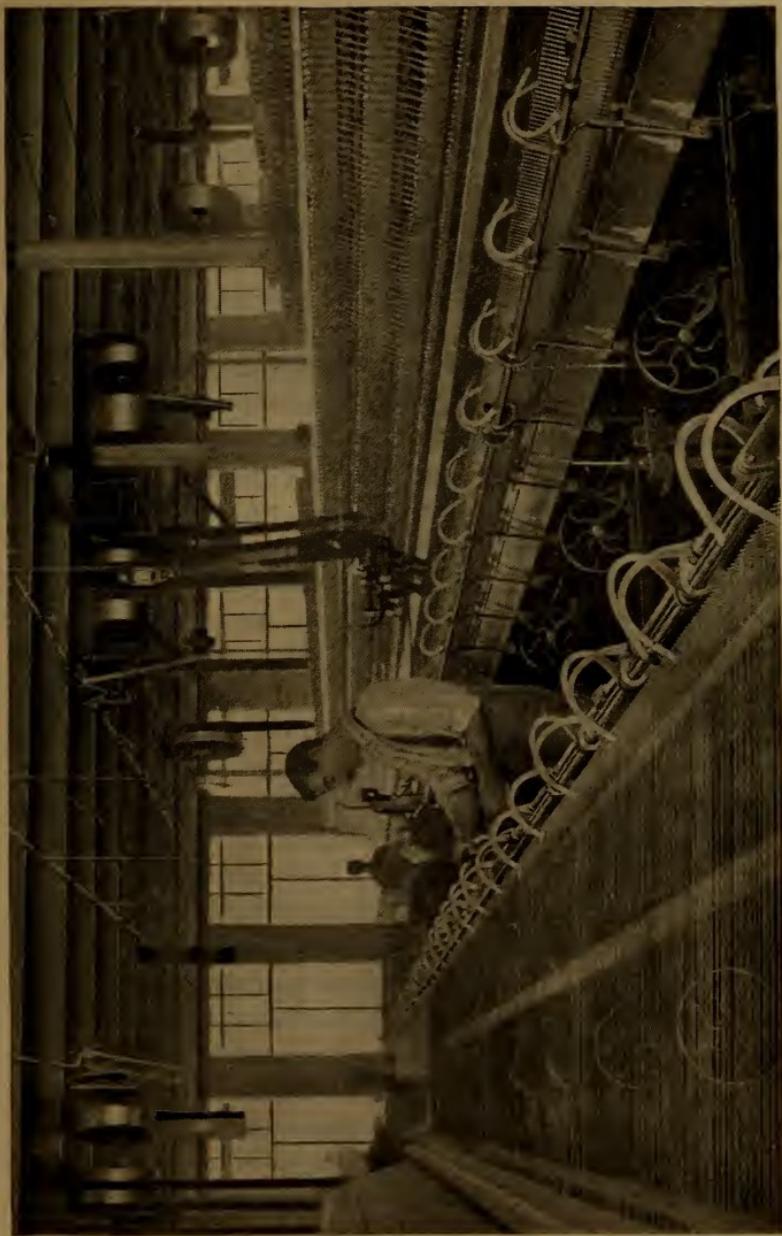


FIG. 2

SPINNING MULE

Not only is this twining or doubling of the warp yarns found to be an advantage in the various processes of weaving and subsequent stages of production, but the combining of these in an intricate pattern like velvet helps to reduce the liability of faults developing in subsequent stages, notably in velvet cutting. This two-fold warp should be the standard specification for all kinds of velvet where sound wearing qualities are required. The final consumer should be educated up to a point where ultimately she will recognize that the *sine qua non* of a good wearing velvet is that it should be built up on a perfect double warp.

Details of Construction and Looms. This final twisting is invariably done the reverse way to the twisting in the spinning of the single yarn, so as to make a smooth and even yarn, as in reversing the twisting the turns in the yarn accommodate themselves and help to coil automatically round each other. These doubled yarns are made from counts or numbers of double the fineness, so that the resultant doubled yarn is equal in counts or numbers to the original single yarn, but vastly superior in levelness and strength, and incidentally the extra processes necessary for the twisting or doubling add very materially to the cost. The counts or numbers are reckoned as follows : If a warp was intended to be made from 30's single counts (that is a standard, and means that thirty times 840 yards (1 hank) equals one pound weight of yarn), but if it was found that the single yarn could not be made strong enough for the weight of cloth required, a yarn made from two ends of 60's (technically known as 2/60's) would be used instead. In like manner a 35's single would have as its counterpart a 2/70's, or a single 40's would require 2/80's, and in every case the resultant doubled yarn would be more level and very much stronger and would produce

superior cloth, though once again at a greatly increased cost because of the additional doubling process and also the higher cost of the finer single yarns used in the doubling.

The employment of these two-fold warp yarns is a necessity in those qualities of cotton velvet intended for dresses, costumes and garments, where it is necessary that the fabric should stand some amount of friction, and whilst excellent qualities are made with warps of single yarn, they are such as are designed for appearance and not for hard wear.

It is very essential that the yarn should be free from blemishes in the way of motes and fragments of seed or uneven threads, and the cleaning and spinning processes from the raw cotton to the yarn are matters requiring the most careful attention and experience, as if the cotton is but imperfectly cleaned the great probability is that the impurities will be carried through on the yarn and on to the cloth itself, resulting in very well defined faults in the special fabric we have under consideration, and causing blemishes in the finished pile of the velvet, as the impurities or bad places in the finished yarn will prevent the ends of weft or pile yarn from lying in the cloth in the regular order which is necessary for an even or level pile.

Having now decided on the quality of the yarn, either single or two-fold according to the variety, quality and weight of our cloth, we proceed to wind the yarn on to fairly large bobbins, during which winding endeavours are made as far as possible to do what is technically known as to "clear" the yarn, meaning that any impurities—motes, seeds, bad ends—must be attempted to be removed or "cleared" here, as this is the last opportunity to treat the yarn with this idea in view. The yarn is wound on to bobbins frequently containing as much as

40,000 to 60,000 yards, which bobbins are in turn placed in a frame for winding on to a still larger bobbin, or one might say a warper's beam as it is known in the mills. This beam is for bringing together and condensing into the smallest area the effective number of threads required to be used for the different widths of cloth. It might be stated in another way as the collecting of the individual threads from the bobbins on to the warper's beam in the form of a tape. Sometimes a dozen or even more of these large bobbins or beams are required to hold the number of ends needed to make a wide quality of cloth.

These beams, or bobbins, are now taken to the sizing machine, where the whole of the yarn has to be passed through boiling size, in order to lay the outside fibres which are more or less inherent with every cotton yarn, and also to help it to withstand the rather rough treatment it will be called on to bear in the process of weaving, and which will be described later. The sizing itself has to be done with the greatest care, and (as after immersion in the size it is not commercially possible to air dry every end) recourse must be had to heat, and large steam heated cylinders (or a multitude of smaller rollers in heated chambers) are used to dry the yarn after passing through the boiling hot wet size. The size itself must consist of the purest vegetable substances, such as sago, farina, maize or flour, and invariably to prevent impurities being present the sizing material, whichever kind is used, is forced twice over through fine silk screens or meshes which effectively free it from any undesirable particles, such as seeds, shells or dirt, and leave a beautifully clean and pure starch product.

The warp after passing through the beck of boiling size travels between heavy flannel covered rollers to press out the surplus size, and is then passed over the

heated cylinders or rollers as the case may be. The threads then appear as a solid sheet, but by passing under and over rods each end is separated gently from its fellow and finally again separated by a comb (technically "wraithe") in the finishing end of the machine and then wound on to a large bobbin or beam under pressure—these bobbins or beams frequently having upwards of 5,000 ends of yarn on them.

From the sizing, the warp or beam is taken to the twisting or drawing-in department, which means that all the ends of the warp are to be drawn separately through eyes or loops formed in the toughened and varnished yarn or metal, and held in wooden frames, known in Great Britain as "healds," and in U.S.A. and Canada as "heddles." Healds were known and used by Ancient Egyptians and Greeks, afterwards improved by the natives of India who made a balanced set of healds, making one half of the warp to separate the other half by a coupled heald something after the manner commonly used to-day. This means that as one half of the yarn was drawn down it automatically lifted the other half up, making a passage for the reception of the weft and, by continual reversing of the position forming the fabric with the weft between. The object of this "drawing in" is to cause the healds or heddles to control in each case such a portion of the warp as may be necessary to form the pattern of the cloth when it reaches the loom. At the same time when each end is being drawn through the separate healds or heddles, the ends are placed singly or in pairs, or occasionally more, in the interstices between strips of highly polished flattened steel of a very oblong section known in the trade as the "reed." These strips of steel are very flexible sideways to accommodate the threads of the warp passing between them, but on edge

they are very firm, and bound in frame supports top and bottom, the distance apart from strip to strip being fixed mechanically in setting out the reed in the reed-making machine, and governs the final width and count of the cloth, that is the number of threads per inch in the warp.

This work has up to now been done, and is frequently done even to-day, by hand and is very tedious, but mechanical means are making considerable progress, and probably before many years elapse hand "drawing in," etc., will be a thing of the past.

For ordinary or plain velvet or fustian cloth, the warp is now ready for the loom for weaving, and generally speaking the actual *modus operandi* of weaving is the same in all pile fabrics throughout, except that in the case of woven figured goods the control of the separate threads has to be far more divided, and mechanism of a more or less elaborate type is required, according to the design or pattern selected, this being done on the loom termed a "Jacquard" after the Frenchman who invented it.

In illustration No. 3 all the details in a modern weaving shed are shown. The photograph also gives a good idea of the disposition and arrangements in a good class modern weaving shed. As will be seen from the looms in the foreground, all the operations in the cycle of weaving velvets given in detail in the following pages can be followed. The girl is seen starting the loom with her hand on the starting handle. At the loom on the other side are the healds, the functions of which are described in detail on page 27. This is the first operation of the cycle. On the near side is the shuttle ready to put in the pick of pile weft—the second operation of the cycle; and finally the lathe, ready for beating up the pile against the reed or dent which can be seen in the looms,

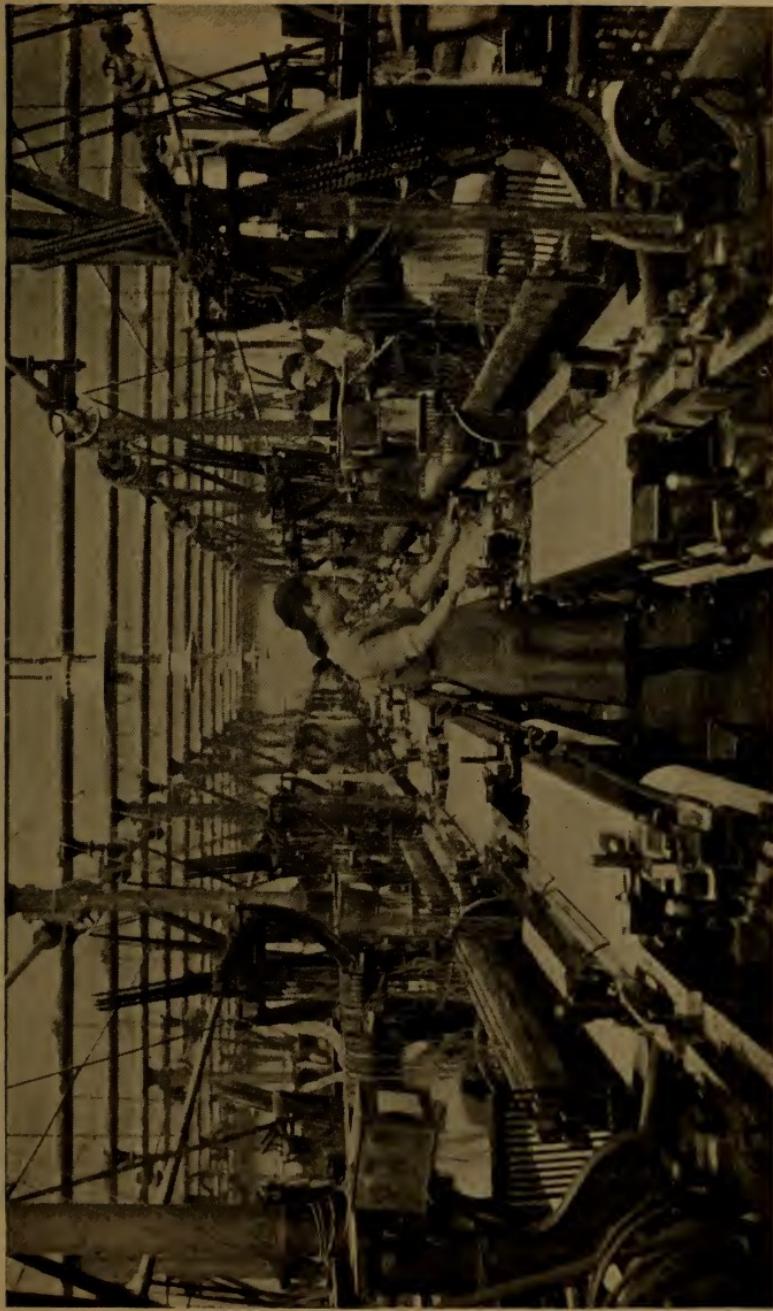


FIG. 3

VELVET WEAVING SHED

whilst the loom on the right hand shows at its side the gears to work the tappets. The woven piece of velvet is shown rolled up beneath the loom, and in the background is the back beam upon which the warp is wound, as detailed on p. 26.

Illustration No. 4 gives a good idea of the Jacquard principle as applied to a velvet loom for the weaving of figured velvets. At the back of the loom is seen a great array of cards which form the pattern ; in this case 2,400 cards take their ordained share in producing the figure on the velvet, and each card manipulates separately 3,000 warp ends, playing upon 400 needles. There is probably nothing more impressive to the layman in the processes of velvet weaving than the ordered complexity of these movements. One may borrow from Kipling's masterly description of the marine engine at work, and apply to the notable invention of the Lyons net weaver his words—"foreseen, ordained, decreed," as every hole in these 2,000 cards has had to be thought out and worked out to produce this figured velvet pattern.

The process of weaving must be almost as old as the world itself or since men could not find a sufficiency of skins to cover them, and the process is just as it was in the dark ages, that is a proportion of the warp threads were separated and a thread of yarn (locally called "weft," in America "filling") introduced between the open space thus caused, the end of weft is afterwards bound in its place by reversing the previous position of the warp threads, and so on, one section of threads being the top threads against one pick or layer of weft, and the underneath threads against the next pick and layer of weft.

From this it will be easily gathered that to make any type of fabric after getting the yarns, warp and weft,

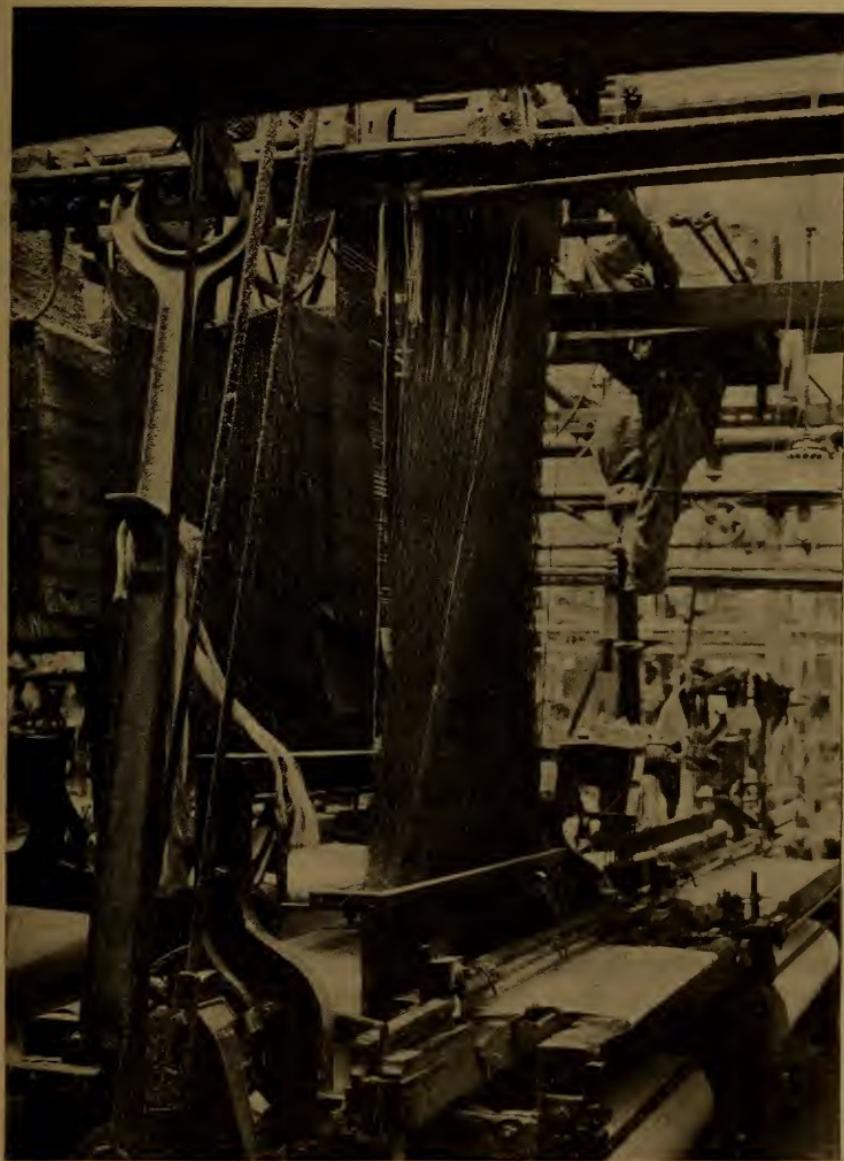


FIG. 4

JACQUARD VELVET WEAVING

it is simply a matter of controlling the individual threads forming the warp in such a manner as to cause the weft to be put in between any pre-determined number of threads of the warp, and thus give any desired effect in figure, or even colour, if this has been the original idea in setting out.

The moving of the threads composing the warp is automatically done by mechanism in the loom controlling the healds already mentioned, and synchronizing with the opening (as it is termed) of the warp threads a shuttle is propelled by other mechanism of the loom through the space formed. This shuttle made of wood and steel carries a "cop" or "pirn" of the "weft" or "filling" it is desired to use, and has "eyes" at its side somewhat resembling an exaggerated sewing machine shuttle, and through these eyes in its path the shuttle leaves a train of weft or filling as it travels. Immediately this weft has been placed between the warp threads and the shuttle moved clear from the yarn forming the warp, yet another part of the loom mechanism comes into action, this time carrying the reed, previously mentioned as having all the warp threads passing through the divisions between the strips of steel, and this reed (resembling a huge fine comb) pushes the thread of weft perfectly straight and even into its place, after which it moves back, allows the other threads of the warp to open, and once again the shuttle is rushed across leaving another thread of weft, and again the reed comes along and pushes this next thread up against the former one, and continuing so as long as is desired and as the mechanism is kept in motion. At the same time the loom gradually winds on to a roller the cloth which has been woven.

It is a common practice for looms making cloth a yard to a yard and a quarter wide to put in about 200

threads of weft per minute, which means that the shuttle must be sent across the warp threads nearly four times in each second, and the reed comes along and beats each thread into its place at exactly the same speed. Experimentally a loom making 30 in. cloth has worked at 320 picks per minute or over five complete rounds of motion per second, that is the warp opens, the shuttle travels across leaving its train of weft, the reed comes along and places the weft straight, and is in its place each time in less than one-fifth of a second.

It might puzzle the uninitiated why the warp threads had to be sized as pointed out in a previous paragraph, but it will be readily grasped that in the working through the strips of steel forming the reed at the speed mentioned the fine and comparatively weak separate ends of yarn would be rubbed to pieces, or so far frayed and roughened as to make the opening and closing of the warp threads impossible, so the size gives them the necessary protective covering to withstand the friction, and when it is mentioned that in some velvet fabrics the reed dents or steel strips pass over each end of yarn no less than 5,000 to 7,000 times before being woven into cloth, and at the same time it will have been rubbed by the shuttle between 2,500 and 3,500 times, it will be realized that the sizing, to withstand the friction, is a matter for great care and experience.

Various Styles. In a plain type of cloth, in the separation of the warp threads for the passage of the weft between, the yarn is equally divided, i.e. just as many threads are above as below the line of weft, and mechanically this is reversed for the next pick or line of weft, but in a velvet, fustian, or any cloth in which the weft is used to form the face or pile, it is necessary that as much as possible of the weft shall be laid on the surface, only sufficient warp threads being introduced to hold

the weft and keep it in its position when cut, and here we take advantage of the healds to lift just as many, or as few, of the warp threads as may be needed to hold the weft, and the mechanism of the loom is adapted to this end.

The manner of varying the sequence in the lifting of the warp threads, and so producing a change in the

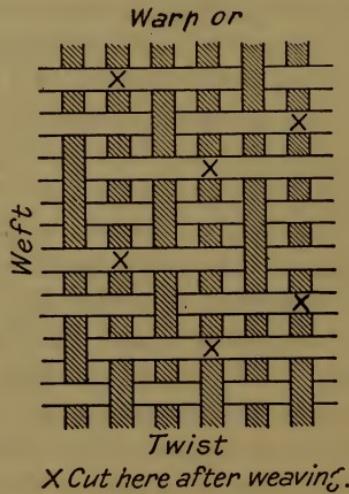


DIAGRAM A
PLAIN VELVET

pattern and character of the velvet to be woven, will be dealt with presently, and it will be shown how alterations in the lifting of the warp threads produce the different qualities of velvet to be described later on.

A general idea of the intersection of threads to form the pattern of a plain velvet is shown in Diagram A.

The weft yarn to form the pile is usually made of the finest long staple American cotton, though not infrequently the good types of Egyptian or Soudan cotton are used. The quality must be of the best so as to turn out a good velvet piece, and to produce

the excellent, soft and full pile, so characteristically beautiful and rich looking. It is essential that the weft used must be spun as soft as possible, with as little binding or control of the fibres as is practicable, as since the pile mentioned is made up of the ends of large numbers of definite and separate fibres, they must be allowed to have perfect freedom, which is not obtainable with a hard twisted yarn, which would be a necessary result if inferior cotton or yarns were used, and would give the cloth a poorer look when finished. The necessity of regarding the importance of the opening out of these fibres is stressed here, and its application to the velvet fabric in its later processes will be observed when we come to consider the operations connected with dressing and dyeing. It is calculated that in every square inch of a medium dress velvet the pile is composed of upwards of three quarters of a million of separate cotton fibres, each of which has to withstand the various operations to be subsequently described.

For this trade the best of everything that commercial conditions will allow should be used. The best cotton, the best spun yarns, the most careful sizing, and finally the operative weaver must be ever on the alert to see that no faults are allowed to go forward into the cloth, and as the human element is at times liable to err, that risk should be minimized to the greatest possible extent by recognizing the truth of the old maxim—"it is impossible to make a silk purse from a sow's ear," and to provide the best material accordingly, looking forward with confidence to the result.

We have shown in the last pages what an intricate process the weaving of velvet is, and how it differs from that of plain cotton goods in some important respects. Perhaps the chief difference is that cotton velvet really consist of two parts, one forming the pile

portion, and one forming the ground or binding portion of the fabric, which portions are interlaced together by binding threads, and so prevent the picks of pile from falling away from the ground cloth when the pile

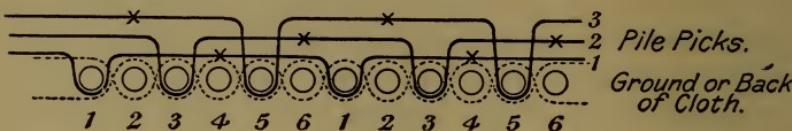


DIAGRAM B

Section of Plain (or tabby) Velvet.

× denotes where the float of weft would be cut to form the pile.

has been cut. Diagram *B* is intended to illustrate these points.

The pile weft is floated over the warp threads in order to form a number of tunnels or races of varying degrees of fineness, running longitudinally down the

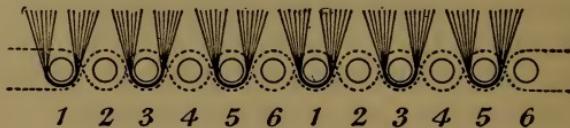


DIAGRAM C

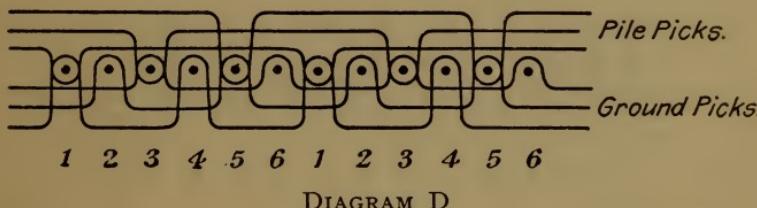
Section of Plain Velvet showing groundweave, and cut pile picks standing erect on each side of binding end.

piece. These tunnels are formed by the weft picks, and their width is controlled by the counts of reed and by the number of warp threads over which these weft picks float at varying intervals, according as the resulting pile when cut is intended to be long or short. Diagram *C* shows the effect of cutting these tunnels or races.

In the case of a plain or so-called tabby velvet (to quote an early designation) with a short pile, the weft threads float over five warp threads before they begin

to intersect ; in the case of a velvet of the finer class—the patent class (the E1 twill or plain E1)—the pile picks float over seven. In the E3 velvet which has quite a long pile the weft floats over nine warp threads, and in the case of the Double Cross Superfine Twill Patent the weft threads float over eleven warp threads, giving a very deep pile in this case.

The groups in which velvets are classified may be divided roughly into two, the plain and the twill backs, and of the plain we have just given a weaving design



Section of Velvet showing Twill Back, or Genoa Velvet.
Note the ground picks at the back of the cloth which serve
as protecting loops to the pile.

illustrated in Diagram A, and followed out in Diagrams *B* and *C*.

Here the intention of the designer is to produce a plain back fabric having a good amount of pile, but no exceptional wearing capacity ; an article of fair appearance, but without much durability and costing a moderate price. Such a quality would be used for dress ornamentation, trimmings and millinery, where hard wear and friction would be generally absent, and not for garments and dresses, etc., for which use its construction is not designed.

On the other hand, in the case of the twill back or Genoa velvet shown in Diagrams *D* and *E* (we have already seen how the Italian town took its part in the early evolution of the article) it is intended to produce

a fabric with a good pile, and to have the pile picks bound in by a larger number of binding picks so as to give strength to the pile, and the arrangement of warp ends and picks is such that the pattern forms the cloth into a twill back, which is to all intents and purposes a fast pile, i.e. the pile will not come out in the subsequent processes of manufacture or when the velvet is worn.

Different Qualities. A velvet woven to this pattern would have all the elements of construction to assure wear and durability in the finished article. To meet

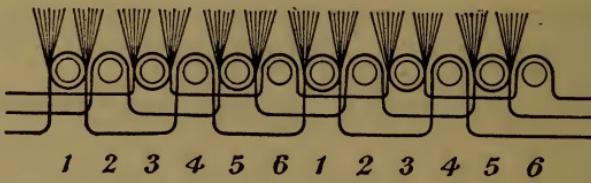


DIAGRAM E

Section of the Twill Back or Genoa Velvet with the pile cut. Note the protection to the pile offered by the loops at the back of the cloth.

this need, one of the stages of development in cotton velvet was the production of a fast pile plain back, in which an increased number of binding threads were used to tie in the pile picks, hence the name of "lash pile" or fast pile. The essential feature was that by this method the pile is bound by being looped under and over three ends in these fast pile weaves, instead of being looped under only one as in the case of ordinary velvet. The effect of this weave of pile was that when dyed and finished the cloth, whilst possessing great durability, had a rather firm touch and lacked that suppleness so essential in the draping of a dress or garment. To obviate this, the twill back or Genoa back was introduced, a combination which secures the fastness of the pile, and at the same time gives a softness

to the fabric, and permits of its draping well. It is in this direction that endeavours are always being made to improve the fabric by giving sufficient tenacity and wear-resistance, but combining with these essentials a lightness of texture and softness of touch, together with draping qualities of equal excellence. The E1 twill has a moderately deep pile, and in the E3 and Fine Twill Patent both have still longer pile.

The plain back E1 and E3, the forerunners of the modern Twill Back Patents, and known in their own times as patent velvets in contradistinction to the original tabby velvets, are now passing into disuse as, though admirable fabrics in point of appearance, their wearing qualities left something to be desired.

All these long pile fabrics of the E3 pattern, which are generally made of very high grade Memphis cotton (having a fibre of about $1\frac{3}{8}$ ins. in length), take the dyeing and the finishing particularly well, and they represent a rather more weighty texture than the E1 or the twill velvets. Some of these qualities contain races (longitudinal tunnels or loops as already explained) as numerous as forty-eight to the inch, indeed, so fine are the races or tunnels as to be invisible to the ordinary observer, but are to be detected by the cutter (as we shall see later) by reason of trained experience.

From time to time superfine velvets, having yarn combinations of much finer counts, have been produced even with twofold 80's to 2/100's warp and 60's to 70's combed weft, and the resulting qualities are of extreme fineness and beauty, but the cost of production is found to be rather beyond the scope of the general purchasing public, and consequently the efforts of manufacturers are directed to the production of those good class fabrics referred to previously, where excellence can be combined with moderate price. In future, however, it may be

forecasted that great attention will be given to perfecting and cheapening the high grade super qualities.

The weaving of corduroy or fustian does not differ in principle from that of velvet—although the technical

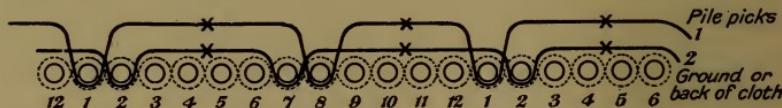


DIAGRAM F

Section of Corduroy showing how the pile picks are bound with floats of 4 and 6 ends to give what is called a round top cord.

The places at which the pile will be cut are marked with a cross.

side of it presents a number of differences in detail. Most of the operations, however, are carried out in the manner described in the pages dealing with the weaving of velvet, and though there are important modifications

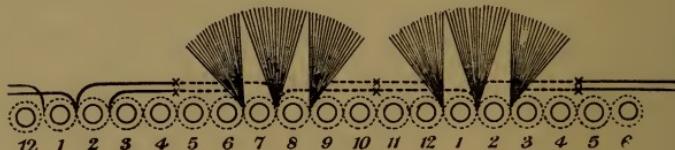


DIAGRAM G

This diagram shows the effect following after F when the pile has actually been cut where marked in F.

The pile picks shown in F are preserved in dotted outline.

in detail and in the quality and fineness of the materials employed, the underlying principle of the production of races or tunnels of uncut pile is in the main the same in all weft pile fabrics.

The accompanying Diagrams F and G, showing the patterns of the designs for producing the ribs of a

corduroy, will serve to illustrate these points of family resemblance. Naturally the design of a plain velvet differs in detail from that of a corduroy, but they both have the common factor of the pile to be woven and cut, and a comparison with Diagrams *C* and *D* will bring out the differences.

CHAPTER V

CUTTING THE PILE

OUR piece of velvet, corduroy, or fustian, having been woven on to the beam, which we see in the illustration of fustian looms, is now taken into the mill warehouse, and after a careful inspection by the overlookers, is weighed, marked, and eventually transported to Manchester. Here it is received in the velvet merchant's grey department and very carefully examined for such faults as the experienced overlookers recognize as being inherent in certain makes and styles of cloth. After passing these tests, the piece of velvet is taken in hand by the stiffener, in whose province it lies to prepare it for the important operation of raising and cutting the pile, known as fustian or velvet cutting.

Preparation. To do this, the cloth must undergo a stiffening process to give it body so that it may be stretched rigidly and tightly on the cutting frames, and to prevent the tufts of pile being drawn out when the pile is being cut.

A coating of flour paste is applied to the back, and a thin coating of lime paste is applied to the face, in order to give cutting edge to the fibre when it touches the knife edge. Other substitutes are employed for liming with the same object of giving a cutting edge. The cloth is dried over steam-heated cylinders, and is now ready for cutting.

Substantially this method is followed in the various grades of velvets, both of the dress qualities and others, heavy velveteens and corduroys, though the latter usually undergo another process preceding stiffening,

known as perching, which consists in carding or scratching the back of the cloth to produce on it a short, thick, woolly nap, thereby softening the strong firm back of the heavier qualities, and helping to give a softer, kinder and more clothly feel to the article in its finished state.

Until now our piece of velvet as it came from the loom is, to all intents, hardly distinguishable from other plain cotton fabrics, but the next operation emphasizes the distinction.

General Description. This raising and forming the pile continues to be known generally as fustian cutting, though velvet cutting is perhaps more descriptive now. Barlow, in his *History of Weaving*, dates the invention of fustian cutting back more than four centuries ago, and informs us that in 1494 an improvement was introduced in the manufacture of "fustians which at that time were brought in the rough state from abroad and finished here." An Act goes on to describe how fustians brought from beyond the sea were manipulated with crows or strong combs to pluck out the nap and cotton of the same fustians, and this was considered to mislead the common people, as fustians so treated and fired did not last nearly as long as the "common people" had been accustomed to expect in the wear of their doublets. Evidently fustian cutting was, in its early developments, strongly discouraged by the authorities, who objected to this operation of cutting, and the subsequent dressing and singeing, and enacted that shearing only was to be practised.

We have traced the rise and growth of fustian manufacture about the fifteenth and sixteenth centuries in the Manchester district, and have seen it developing in the seventeenth and eighteenth into a number of those sub-divisions which are comprised in the fustian

trade of to-day. Fustian cutting as a craft evidently developed in the latter part of this pre-mechanical period, and here and there minor poets broke out into verse about the charm of the fustian cutter's life. To-day it may seem a prosaic vocation, but in the seventeenth and eighteenth centuries it evidently inspired some of its workers. We have seen how Oldham was an early outpost of fustian manufacturing—the neighbouring village of Gravelhole was for a long time almost the metropolis of fustian and velvet cutting, until the needs of development and expansion made the leaders of the industry migrate to the more rural district of Cheshire and Staffordshire where in the agricultural and mining districts there was always a surplus of female labour willing to be drawn into the mysteries of fustian and velvet cutting.

The bulk of the work is still done by hand labour. We have already noted in the chapter on Weaving that the pile is woven in a series of loops, forming longitudinal tunnels of greater or less fineness, according as the texture is a common velvet, a fine or superfine velvet, a heavy velveteen or a corduroy. The fineness of these tunnels may be judged from the fact that more than a thousand such may be found in the width of a piece of grey velvet 29 ins. wide, giving approximately forty tunnels, or as the technical term is—"races"—to the inch. In some exceptional cases there are nearly fifty of these races. It will be evident from this that the tunnels of this fineness are practically invisible to the naked eye, but an experienced operator discovers this race or tunnel through the sense of touch.

After the piece has been stiffened (as previously described) it is taken in hand by the cutter who stretches it on a long frame, generally about 9 to 11 yards long, although in exceptional cases a frame will contain a

length of 17 yards. The piece is stretched tightly between the rollers at each end of the frame—a process known as beaming-up—and when so stretched the stiffened piece presents a comparatively rigid surface to the velvet cutting knife. As we noted in a previous chapter, the face of the uncut pile is made firmer by the use of lime, generally applied mechanically, but sometimes this liming, or caustic soda dressing, is done in lengths by the operator who later cuts the piece.

The raising of the pile, or cutting the loops of the tunnels, is effected by a long, very thin, sharp steel blade, inserted in a fine pointed guide and sheath, the whole being attached to a handle, and carried on a cross piece of wood (rest or "level"), the whole forming an instrument about 18 ins. long, as shown in the accompanying illustration (Fig. 5).

The knife is here shown in the process of cutting the piece of velvet, which is stretched over a cutting frame as described. A portion of the piece is already cut, as can be noticed if the illustration is closely examined. The guide, the long thin sharp steel blade, and the wooden handle or "level" are all clearly shown in the illustration, and the manner of holding the "level" in the fingers is shown. The actual cutting parts, i.e. the guide and knife, are substantially the same, either in hand cutting or in the various machines now working, but as is explained elsewhere the method of holding the knife and the style of the holder, vary considerably.

It is necessary that the guide should completely fill the tunnel (race) down which the knife will travel, and the function of this guide is to open out the race, so that the top of it presents a taut surface to the edge of the cutting knife which severs the threads, leaving the walls, as it were, of the tunnels standing upright. The operator inserts the guide in the race (operation

known as "setting in") holding the knife firmly but delicately between the fingers, and resting the "level" lightly on the surface of the piece walks rapidly to the end of the piece of cloth being cut, turning and coming down another similar length stretched alongside. This operation is repeated until the operator has completed the eight, ten, or even thirteen hundred races or tunnels comprised in the piece being cut, such depending on the width or quality of it. This necessitates the operator walking some twelve or thirteen miles a day, and the steady tramping of the workers in a cutting-shop is a noticeable feature. The rhythmical sound of many feet, frequently shod with the comfortable but noisy clogs which many operators prefer to boots, is a feature of velvet cutting mills to be remembered. A photograph is shown (Fig. 6) of one of these cutting mills with a large collection of these long frames set up in it.

From this description it will be seen that no considerable movement of wrist or hand can be permitted or the guide will jump out of the race, and will cause a defect in the piece. To produce a good pile careful supervision of the work is necessary, and the weaving of the cloth must have been so perfect that weaving imperfections hardly exist. Obviously a small obstruction in the "race" will deflect the knife and cause it to pass through the back of the cloth, making a hole. In the better classes of velvet there is great immunity from imperfections, but it is difficult to avoid little "kinks" or "neps" in the yarn, cotton seeds or other impurities which may unwittingly be drawn into the cloth at weaving. All of these have to be carefully watched for, and if any number exist, have to be marked before cutting is continued.

Ending and Mending. Subsequently, damages resulting from such defects, or from inexpert work, are made



FIG. 5

CUTTING KNIFE

good in the processes of ending and mending, in which the piece is carefully examined for cutting holes, damages, etc., and if there are any, they are made good by the insertion of tufts of pile to replace the damages.

The joining up of the races at the end of each length, called respectively "settings-in" and "goings-out," calls for much care. In this direction considerable improvement has been made since cutting has passed out of the domestic industry stage into one of better organization. Formerly, the work was done on short frames of two yards, now discarded, and obviously the proportion of the "settings-in" and the joining-up of the two lots of races was very much larger when cut on these short frames than it is to-day when long frames are used. The picture of the old fustian cutter, shown in Fig. 7, will show the now defunct domestic side of the industry. He is cutting here on one of these old short frames which did not long survive the domestic stage. Note the attic in which the work is being carried on.

There is always the foundation of trouble at these commencing and finishing places, and considering the care which has to be exercised in the cutting of the pile, it is astonishing that the transformation of cotton into velvet is possible so economically that good qualities can be sold as cheaply as is the case in normal times.

In some well-organized mills, the frames are lengthened at each end by the addition of small subsidiary tables about 24 ins. long, which permit the operator to get a good start at the beginning of each race, and contribute to the evenness of the pile in the "settings-in."

Slip-cutting. In the cheaper qualities, which naturally are made in a coarser fashion, though still having some 750 to 800 races in the standard width of 22 ins., for economy sake the cutting is frequently

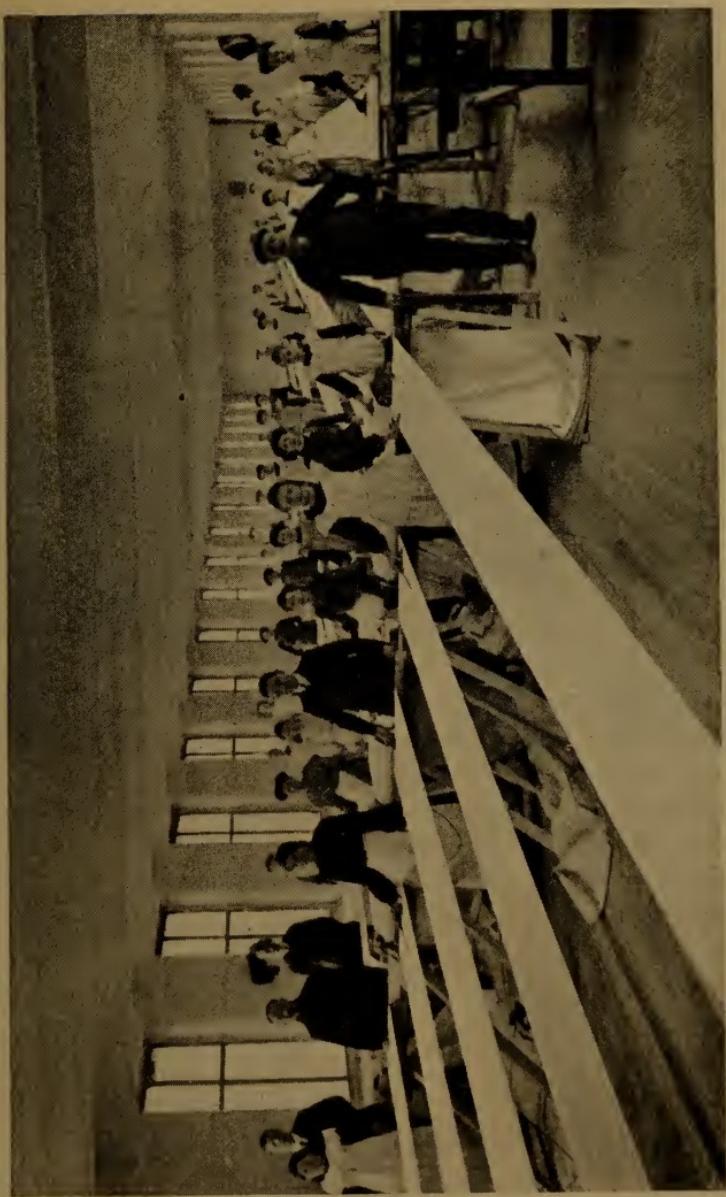


FIG. 6

CUTTING SHOP

done by a method known as slip-cutting. This slip-cutting is frequently employed in the very lowest classes of velvet where price is more an object than quality, and when this method is adopted the knife is inserted in every other race, but actually cuts the float of two races at the same time, although the effect may be broadly stated to be that of cutting every other race.

It may be added that this class of cutting is frequently done with two knives, the operator holding one in each hand, and as the standard of work is not high, it is possible to procure a very much larger output by employing this method. Obviously, if the necessary pile can be produced by half the effort there is much economy in operation, but it is not a process which could be used at all for the medium and good class velvets.

The operation of cutting requires the very greatest care, as if the pile is not produced in the proper fashion, none of the subsequent operations can do justice to the piece, and it may be so indifferently cut as to spoil it for these subsequent operations.

So many qualities have to be produced in order to cater for the varied requirements of the different markets of the world and the different uses to which cotton velvet is now put, that, in well-organized cutting shops, an endeavour is made to keep the hands continuously employed on the same class of work. Standardization of the work in this way certainly makes for a better quality of cutting.

The greatest care is required to see that the guide fits the varying races which the different qualities offer, and the grinding and selection of the knives to fit these races and to be suitable for the qualities is an important factor requiring a skilful and experienced foreman.



Fig. 7
OLD FUSTIAN CUTTER (DOMESTIC STAGE)

These knives are made of the finest Sheffield steel, hammered, drawn out and finely tempered, they must have no flaws and must carry a good edge, so that there is no obvious difference in the various parts of the piece in regard to the pile being cut in a different manner, or being forced open as would be the case with a poor edge.

Velvet cutting is a healthy occupation as now carried on in airy, well-lighted mills, in Cheshire, Staffordshire and Derbyshire, where the work is mainly done. The bulk of the velvet cutting is still done by hand, and some ingenious ideas are shown to increase the output. Some of these will be referred to later on.

CHAPTER VI

MACHINE CUTTING

Machine Cutting. Having considered hand cutting, we will now pass to the important section of power machine cutting, and whilst we have seen the bulk of the cutting is still done by hand, there is a growing amount being done by machinery, and it is safe to prophesy that this will steadily increase. It has been the desire of many inventive people, both those connected with the velvet trade and more particularly others outside, to have the pile cut by mechanical means. Many efforts have been made to solve this problem during the last half-century, few of them getting much beyond the files of the Patent Office—though some serious attempts have been carried on without reaching the point of real success.

To this statement there are, however, two important exceptions, as both the Drey and the Netherwood Cutting Machines have successfully dealt with all classes of velvets.

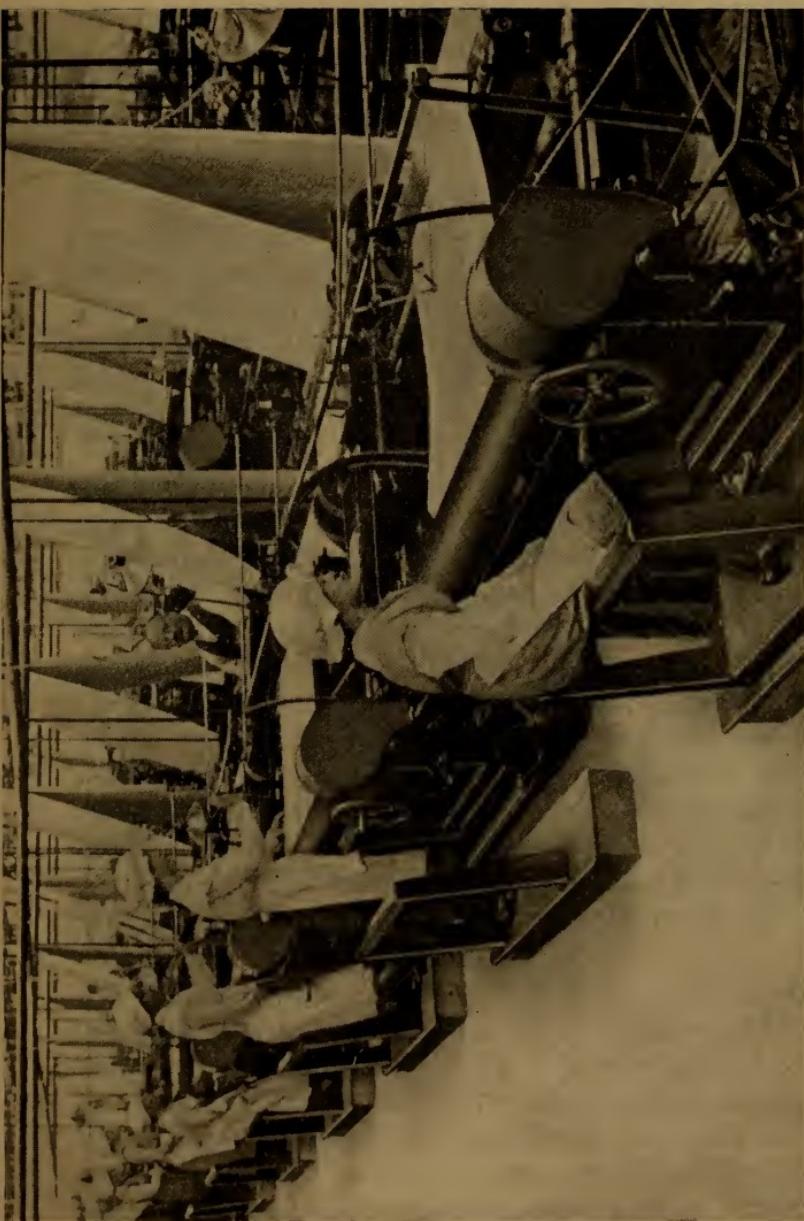
The cutting of corduroys will be dealt with in another section, as power has been successfully applied to that problem for a long time.

Netherwood Machine. In the Netherwood velvet cutting machine, Fig. 8, we can see traces of the original Netherwood cord cutting machine, of which this is really an off-shoot and improvement in as much as the method of drawing the cloth through the machine is rather similar, but it is easily seen that the velvet machine is much more lightly and delicately constructed. In this machine one race or tunnel is

cut at a time, and to effect this the head and tail ends of the piece are joined together, making the piece into a continuous web of cloth, which carried backward and forward over rollers is rapidly drawn towards the knife. The knife is held in position by a light tubular arm which is adjusted by the operator as occasion requires, and as the piece travels forward at something like two hundred yards a minute it will be readily seen that the machine must be freely responsive to any movement of the knife and guide in regard to faults in the weaving or any obstruction in the race. An ingenious arrangement of electro magnets makes it possible for the knife to be thrown instantly out of gear and clear of the cloth should any obstruction be met in the race, and so prevent damage which is liable to be caused by the minor faults to which the velvet tissues are heirs. At the same time the machine is automatically brought to a standstill, this being done quickly by means of adjustable brakes. A point to note is that the arm carrying the knife is mounted on the frame of the machine, and in this point differs essentially from hand-cutting, as the cutting instrument is in some respects rigid. This particular point has been found to be of great advantage in cutting qualities like the old twill-back coating velveteen, one of the most difficult sorts made. Not more than a negligible fraction of hand-cutters ever developed sufficient skill to be entrusted with the cutting of this make of velveteen, but the Netherwood machine has shown special aptitude in its capacity for dealing with these goods. It deals with equal success with the more generally used qualities of velvet, including slip-cuts, velvets—both plain and twill-back, fine twill patents, E1 and E3 sorts, etc., and light or heavy velveteens. The great advantage of this machine is that it is able to cut two pieces at the same time, one arm being used

NETHERWOOD VELVET CUTTING MACHINES

FIG. 8



on each piece, the pieces running side by side. The largest sized Netherwood machine can be set to cut either one piece 66 ins. wide, or two pieces each 33 ins. wide—widths, of course, being before stiffening. The double knife movement, as this is called, naturally greatly increases the amount of production when narrower pieces are being cut. A pleasing characteristic of this machine is the silence and steadiness with which it works, no noisy gear wheels being employed, and as the surfaces of all the rollers move at nearly the same speed as that of the cloth, the loss of weight which might arise to the piece during its many passages through the machine is thereby prevented.

The most important feature of the machine is the device which maintains the correct tension of the piece, for as we have seen in hand-cutting and in other cutting machines, the tension takes place across the full width of the piece, but in the Netherwood machine this is not so, and a particularly effective method is employed. This consists of two travelling belts which only stretch or tension a narrow strip of the cloth, exactly where the cutting is taking place, the position of the knife being in the centre of this taut strip, and as the knife gradually works across the piece, the travelling belts are made to follow and take up the same position in relation to the knife from the commencement to the finish of the piece.

The amount of tension required varies considerably with different pieces, and this is very simply adjusted by two spiral springs, which are either tightened or slackened, as required, by an arrangement provided. By this ingenious tension device the risk of tearing the piece during the process of cutting is reduced to a minimum, and it also gains for the machine a great advantage where driving power is concerned, as the

amount of power required is considerably less than that absorbed by a machine which tightens the full width of the piece.

A point to note (as shown in illustration, Fig. 8) is the lay-out of the works, which has been designed to meet the needs of the machine, and spacious though this looks the floor space may be compared to that required for the long frames described in hand cutting, whereas the output is three or four times greater. As regards economy of drive, a $1\frac{1}{2}$ h.p. electric motor drives each machine, even when cutting heavy velveteen, 60 ins. wide. When the cutting is performed at a rapid rate, the necessity of a really good light is paramount, and this is provided for in the cutting shed using this machine.

It may be said that on cloth of good character the percentage of holes made by this machine is negligible, being fully equal to the best average of selected hand cutters.

The Netherwood machine has been made possible by the application of electricity to the motor and the installation of magnetism controlling the knife mechanism. The use of power and the cutting of one individual race throughout the entire length of the piece, besides obviating the difficulty about "settings-in" which haunts the hand-cutter, admits of a larger guide being used in the race, thereby presenting a cleaner surface to the knife so that the weft is severed in a sharper fashion, and contributes to what may be technically called a "good race." So important is this advantage of the large guide that a knife can cut 130 miles of these tunnels or loops of picks of weft with one sharpening. Consequently the pile cut on this machine is of very good class, superior to hand-cutting, and with the tendency of demand calling for the production of goods, alike of

broad width and good quality, the future holds an important place for velvet-cutting by machinery.

As in the case of the hand-cut pieces, these must be well stiffened and limed on the face to ensure a good surface against the knife blade, and the knives themselves must be of the finest steel and hardened at the highest temperature, thereby making it possible to cut the majority of pieces with one edge throughout and so eliminating edge marks, as the marks liable to be caused by a newly sharpened knife are called.

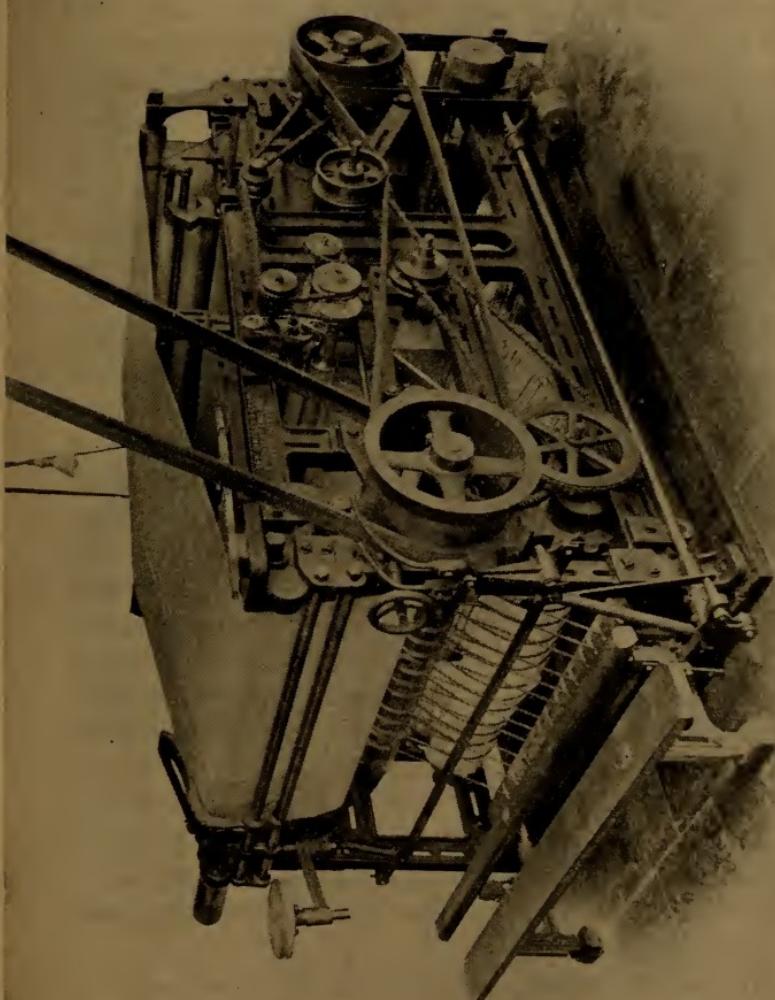
Drey Machine. This machine was introduced about thirty years ago to solve the problem of velvet pile cutting. Ever since then it has been working successfully both at home and abroad, and many valuable improvements have been effected as the result of experience.

The principle of the machine is that one race is cut at a time, pretty much in the same way as is adopted in hand-cutting, and the makers adopt a knife which is not a fixed part of the machine, but is held by the operator. The knife consists of a long metal knife holder, made of aluminium for lightness, with a knife and guide which are held in position by a trigger motion, fixed in a slot. The guide is slightly bent so as to permit the operator to hold the knife at a suitable angle to meet the cloth.

The piece of velvet to be cut is made into a continuous web by sewing the two ends together, and it is then carried over a series of rollers in order to give the necessary tension to the piece on the top where it meets the knife. To give this tension the cloth passes over four rollers at the front, only one of which is covered, the others being plain. The tension of the piece is tight right across its full width, and an ingenious arrangement of nipping rollers in the middle of the machine helps to start the tension.

DREY CUTTING MACHINE

FIG. 9



The machine is driven from a shaft at the back, which also drives the creeping arrangement, carrying the slack of the piece along the base of the machine, while the plaiter lays the piece into folds, and all the other subsidiary drives are from the back shaft also. The result of this is that when it is necessary to stop the machine the stop movement is instantaneous, as everything is driven from this rear shaft. Directly the knife and guide strike any obstruction in the race, the trigger movement is at once released, and the knife and guide are thrown out of action before they can make anything but a very small hole. At the same time the operator takes her foot from the forward pulley, and semi-automatically touches the reverse—thus bringing the brake motion into action immediately. To pick up the race again, the operator has just to reverse the piece, and bring it back to the point where the defect occurs. The possible travel of the reverse is about four yards, but in general practice not more than 2 or 3 ft. will be used. The normal speed of the piece is approximately 500 ft. per minute and this means that a full race of a piece of 150 yards is run through in about fifty-five seconds, making about nine to ten hours for the cutting of an average piece of 22 ins. wide.

Naturally the tempering of the knives and guides is an important point, and for this purpose a carbon steel is found to be the best, although experimenting has been done with high-speed steel, not altogether with satisfaction as yet.

By this method of machine-cutting the “settings-in,” which, as is explained elsewhere, are the bane of hand-cutting, are entirely avoided. It is frequently found possible to run right across the piece with one edge, but there are times when it is found necessary to edge the knife three or four times, in order to cut the pile

right across. There are, of course, but only on rare occasions, edge marks, but bad ones are an exception. The makers consider that one advantage of their system is that the operator by holding the knife in her hand is enabled to maintain the human touch, which has always been an important point in the cutting of velvet pile, and also the operator can judge of the condition of the knife edge, which would not be possible were the knife to be held in a mechanical holder. Quite frequently it is found possible to cut a number of pieces on this machine without making a single hole.

In order to save operating expenses, and to reduce the horse-power required to drive, great endeavours have been made to make the machine as light as possible, and in the newer machines aluminium has been largely employed in order to secure the necessary lightness, resulting in a great economy in driving. The knives on the new machines are all mounted in aluminium holders, and a rest is supplied for the left arm of the operator where necessary, also, when asked for, a convenient seat for the operator while at work. The position of the operator in this machine is in front, and this position gives the best chance of obtaining a good race, besides there is very little liability of "towart and frowt" cutting from this position, as there is no reaching over.

One of the most important things contributing to good machine-cutting is that the "liming" should be specially attended to, as well as the stiffening. This has been found to exercise a very important influence on the character of the work produced. Without good stiffening and "liming" it is not possible to produce work of the right character. The Drey machine is also very good for hollow-cutting.

It is interesting to record the fact that the firm have

still in their employ two cutters who worked on what may be called the original of the power cutting machine.

As a testimony to the simplicity and straightforwardness of the machine, the makers estimate that it only requires one mechanic to look after one hundred of these machines. A very important point to remember in these times is the comparatively small amount of



FIG. 10

ROGER AND FLEMING HAND-CUTTING MACHINE

space which each machine takes up, representing a large economy in floor space—an item that ought to be considered in these days of high cost of building materials. The horse-power required varies from one horse-power for a narrow and light piece to three horse-power for a 50 in. heavy piece.

The George Roger hand-cutting machines are a sort of half-way house between the simple hand-cutting as described elsewhere, and the more elaborate machines which we have just dealt with. This machine

is worked by means of a horizontal wheel with a handle turned by the operator. This horizontal wheel drives by means of pulleys a long belt cord, running to another horizontal wheel at the opposite end of the frame on which the piece is stretched, supported by a canvas table, the full length of ten yards. To this length of endless cord belt there are attached over the face of each of the two pieces to be cut light wooden carriages or platforms, on each of which there rests lightly the haft and level of a normal cutting knife. The knife is placed in the race in the ordinary fashion, and when the handle of the wheel is turned round the cord pulls the platform along, which, carrying the knife with it, moves up the length of the race, cutting it, and the other length of the cord at the same time brings back the second knife which has completed its task of cutting a race. The movement is then reversed and the first knife goes up again, and the second alternately backwards and forwards with regularity and considerable speed.

To guard against the knife meeting with defects which would form holes, it is, as we explained, mounted loosely on a platform, but the "level" or haft of the knife fits into a slot on the platform, and is attached to the rope and the platform by a thin cotton string of a breaking strain, lower than the resistance which the knife would experience when it met with the obstruction. Consequently, when the operator turns the wheel and the knife meets with such an obstruction, the thin cotton is broken by the slight pressure resulting, and the cutting ceases before a very serious hole has been made. The addition of a small wire brush part way along the handle automatically adds to this retarding effect.

It is strange that this simple hand machine has

not made greater progress in the cutting industry, as it seems to possess advantages over the ordinary method of hand-cutting. The output is claimed to be very considerable. A couple of pieces $22\frac{1}{2}$ ins. wide can be cut in five and a half days, which is a considerable reduction on the average of hand-cutting. Whilst this does not rival that of the power machine it has to be remembered that the cost of this very simple machine is negligible, compared with the more complicated and heavier power machines. In the Fleming machine a number of elaborations have been made in order to give the operator a sufficient delicacy of touch, such as a bell handle mounted on the turning wheel, and to ensure light running the wheels have been mounted on ball bearings. With regard to the hand-cutting of wide pieces, an ingenious rotary tubular cutting frame has been produced, in which the piece exposes only a small and fairly firm surface, instead of the broad and somewhat yielding surface presented by the ordinary hand-cutting frame. The slight tension which is both supporting and elastic may have good results, and certainly saves space. A minimum of holes is claimed for this apparatus.

The Roger hand machines have, we understand, been adopted in some foreign countries where power machine cutting has not yet progressed.

There is also a Roger power machine, which represents simplicity of construction, and if the advantage is evident when large numbers are working, it will certainly help to simplify cutting problems of the future. A number of improvements and ideas have been introduced in hand-frame cutting by the same inventor, notably the addition of a canvas table beneath the piece. This simple fitment is said to help the character of the work very considerably. It certainly permits

the piece to stand at a less uneven tension, and to rest in such a way that the operator can more easily control her work.

Another cutting machine which has been brought to some perfection is the Thomason machine. This is somewhat of the character of the Netherwood machine, and contains a number of useful ideas, relying also on an electric magnet and balanced brake mechanism to stop the machine, throw the trigger of the knife out of gear, and put the brake on the roller movement, altogether showing some very ingenious ideas.

Hollow-cutting. Before leaving the question of cutting, it is desirable to refer to an ingenious variation of the cutting of patent and twill patent velvets, known as hollow-cutting, in which a medium or broad rib is produced on a plain velvet face by an ingenious method of hollowing out a race, or races, into a series of stripes and then filling in the remainder of the races to form a rib or cord. For high-class purposes corded or striped velvets of this sort have a constant vogue. The article has much to recommend it, as it makes available a cord rib with all the advantages inherent in plain velvet, i.e. close, soft, and lustrous pile, light weight, and another advantage over ordinary woven cord is that although there is a cord, stripe or rib, there is never, when the fabric is turned back, any part of the back shown, as the back is practically all velvet. When a cord is turned back, in various subsequent uses for garments, the space between the ribs may show, and is in contrast to the pile portion at times. A quality of this sort takes a very fine lustre and finish, due to the high-grade cotton employed in its manufacture.

When the pieces are cut they are again returned to the merchant's grey department, where, after examination, they are allocated to the orders they are required

to fill, experience showing the overlookers the suitability of certain pieces for blacks or colours.

Ending and Mending. After cutting, and generally after the cut piece has been returned to the Manchester merchant's warehouse, it is inspected for cutting, and any imperfections and minor damages which are then revealed are made good by enders and menders. This work of ending and mending consists in deftly making good or replacing any small defects in the piece where, through some fault in the piece when woven or from some accident in manipulating the cutting knife, a small damage has occurred. The enders and menders carefully search the cut pieces of grey velvet for these blemishes and holes, and then set about repairing them by drawing them together—darning them so to speak, and dexterously inserting similar fine threads of mending cotton into the place or hole which needs them. In this imperfect world it has not been found commercially possible to produce definitely faultless pieces. The defects which may and do arise in weaving may be accentuated in cutting, and if left unrepaired would, when dyed, be still further exaggerated even to disfigurement. The proportion of such defects in a full piece of 75/100 yards of good class quality may be as trifling as one or two per cent, but this low percentage cannot unfortunately be sustained in the less perfect qualities. Here we have an illustration of the necessity of the doubled warp threads already referred to, as the blemishes therein are much reduced and the resulting faults very few. The single yarn threads obviously will not stand up to the various strains as do the doubled ones, hence more holes and defects arise in cutting. Such a blemish if it appeared when dyed and finished in a high-class quality would mean disfigurement of the garment and loss to the garment manufacturer.

If this ending is taken in hand early enough and properly performed, it means that the improvised pile may, when the pieces are subsequently dyed and finished, cover up the original defect. Consequently, ending and mending must be performed by experts, so that the subsequent operations can cover up the fault.

CHAPTER VII

DYEING AND FINISHING

Dyeing and Finishing. The dyers now take charge of the pieces. As the manufacture of fustians developing into velvets is of ancient origin, so have dyeing processes changed from their early forerunners into the production of the rich, soft, silky pile fabrics of to-day. Dr. Aikin, in his *History of Manchester*, gives an interesting account of the evolution of fustian and velvet dyeing, showing how many of the methods still employed are in principle those of the earlier times. In his reference to Mr. John Wilson of Ainsworth, who was an early pioneer in velvet production, he adds a significant remark in regard to the training of his staff—"none of the workmen previously employed in dressing and bleaching would suit his purpose on account of their attachment to old methods." This attitude has been urged against those concerned in velvet and corduroy manufacture from time to time, but happily a realization of the necessity for continued progress has replaced it, and the velvet dyeing now produced in this country is at the head of the list.

We have now followed our piece of grey velvet through the stage where the essential part—i.e. the nap or pile—is produced upon it. The next thing is to watch it through the various processes preparatory to, and terminating in, dyeing.

When the grey velvet pieces, marked with the individual merchant's distinctive marks, arrive at the dye-works, they are booked-in and stamped and the works' order numbers are put on them. The first

VELVET DYEHOUSE

FIG. 11



measure is to plunge them in huge tanks filled with boiling water, a hundred pieces in a tank, where they soak in hot water with the object of cleansing them from the impurities they have absorbed. We have seen that the goods are stiffened, limed and treated in various ways, in order to lend them body for the operation of cutting, and there is plenty of foreign matter in them after they have been cut. All this has to be got rid of, and, in addition, the pile threads, which we have observed were spun in a special manner in order to open out in a velvety mass of pile points when cut, have now to be encouraged to open out.

After this boiling has softened and partially cleansed the pieces, they are taken to a large box-shaped machine, called the "wince," which is filled with hot water, and through which the pieces are kept constantly carried by a revolving roller. After being thoroughly cleansed from all impurities in this machine, the piece is folded up, heavy with the accumulated water in its fibres, and is taken to the Hydro Extractor or "Whizzer." This consists of a huge enclosed cylinder into which the piece after being wound on a drum is inserted. The whole machine is spun rapidly round, and the water is drained out by centrifugal force through the numerous perforations in the cylinder. The bulk of the water is thereby extracted, and in order not to injure the pile a special type of hydro extractor is employed.

Freed from the bulk of the water in this manner, the piece is thoroughly dried by passing over the numerous heated cylinders of a drying machine. Emerging at the other end thoroughly dry and free from impurities, the fabric now begins to assume some of the touch and appearance of velvet.

To loosen and soften the pile the cloth has now to be treated by the brushing or dressing machine. The

pile is well brushed up by brushes working crosswise, and loosening and raising the pile. The opening out and brushing convert a rather rough and blankety looking fabric into one still more like velvet, with a soft and rather fluffy pile. After this treatment the piece is ready for dressing, an operation which requires great care. Experience counts for a great deal, as a piece spoilt at this stage is spoilt irretrievably. Cords are dealt with in much the same way as plain velvets.

The piece is next taken to the firing or singeing machine. Here are huge metal cylinders, slowly revolving, heated to a red or almost white heat. The piece is run over these surfaces and the little projecting filaments of rough pile are burned off. The hairy fibres and unevennesses, which may have been brought up during the preparatory work of brushing and dressing, are now burnt away in course of the slight momentary contact with the face of the piece. Lack of care here would result in burning up the piece, and any stoppage produces this result. The operation is an interesting and rather alarming one to watch. It seems as though the piece might at any time be consumed by this glowing metal. The process makes the pile smooth and even, and we have the material, which we have traced through so many departments, at last transformed into real velvet, displaying the softness and smoothness, characteristic of that fabric, and, to some extent, the natural lustre of its velvet pile.

The singeing or firing may alternatively be effected by rows of gas jets, just barely scorching the pile, or by the incandescent rollers already mentioned. The choice of method is determined by the qualities of the pieces sent for treatment.

Our piece, having reached the "picker" stage, as

it is called, is carefully examined and graded as to its suitability for black or colour dyeing. As the momentary contact with the incandescent rollers or the gas jet has singed the points of the pile in addition to having burnt off the irregularities, a brown, burned appearance has been imparted to the face, and this must be removed before the cloth will take many of the shades into which velvet has to be dyed. This, in nearly all cases, necessitates bleaching. In bleaching, the piece is boiled in an alkaline solution, treated with sulphuric acid, or "soured," subjected to more "chemicing" and to further treatment with acid, before finally being washed to clear all the chemicals away. Care has to be taken to keep the pile of velvet straight and even. Some fabrics can be passed through like ropes with the greatest expedition, but every care is needed to keep the pile of velvet straight, and obviously this can only be done by a slower treatment.

After bleaching, the piece is a beautiful white material, ready for the dye-tub. The dye-jigger—ancient machine though it is—remains the apparatus most often used in dyeing velvets, and to this jigger the piece is now taken. By means of rollers the piece is carried through a tank filled with the dyeing solution, and wound from the top down to the bottom roller, and back again and again, until it has absorbed the requisite amount of colour. Again, the cloth has to be put through a cylinder drying machine, similarly to that previously described.

Another process connected specially with velvet dyeing, which is one requiring both skill and experience, is the addition of colour in the form of painting, or adding colour to the pile. This is really a form of printing, and is a development of velvet dyeing peculiar to modern times. What was formerly known as the New Black in distinction to the Old Black (i.e. a direct

dye of the Logwood character) has been produced by improvements of this character.

After dyeing, the piece has to go back to the brushing machine in order to have the pile straightened into the orderly fashion in which we left it previously. Incidentally it may be noted that all the processes of velvet dyeing, printing, and finishing, require the greatest care in handling the pile. Treated too harshly or broken in any way, the pile may be damaged beyond repair. This is an added responsibility beyond that of the operations followed out in producing plain cotton fabrics. Various drying processes, technically known as "ageing," follow on, before the piece may be considered a fully dyed velvet.

After these have been performed, pile brushing is again necessary to clear off any hairy fibres which have worked up, and this is now done in the shearing or cropping machine. Rapidly revolving knives skim the surface of the velvet many times to secure the even, smooth surface, so characteristic of the fabric, much as a lawn mower works over a grass lawn, but with the very utmost precision.

Before we reach the final stages in this part of the life history of our velvet piece, we have to give it a lustre or polish to bring out all its bloom and "reflet," as well as to soften the pile and make it velvet in the fullest sense. This is done by applying wax and similar polishing materials and by carefully laying the pile in one direction by the use of heavy polishing blocks; or in some instances by stretching the pieces out on finishing frames or slabs, and manipulating the pile in one uniform direction by the aid of bosses, etc.

Fast Colours. Fast to Rubbing. Special processes have been evolved in dyeing the better classes of velvet and pile fabrics, whereby the colours are rendered "fast

to rubbing." It is not within the scope of this chapter to deal with these beyond saying that this method of dyeing is necessary for all classes of velvets destined for dress or garments. Use of the process should be developed in every possible way for the final benefit of the consumer, to whom it is a real boon. A further development in this search after fast colours has resulted in the "fast to light" or "non-fading" colours referred to later on.

CHAPTER VIII

DISTRIBUTION, SELLING AND SUBSIDIARY OPERATIONS

The Merchant and Distribution. After final inspection and verification of the dye, finish, etc., the piece of velvet finds its way back to the Dyed department of the merchant from whom it originally came. Here it is selected to fill, according to its suitability, the orders which come to Manchester from all the countries round the Seven Seas. Their requirements are varied, and whilst there is a certain uniformity in the dictates of fashion in the temperate zones of the world, which have, for reasons of density of population, agglomerations of large cities, etc., more steady buying power, there are important modifications in detail in the requirements of the warmer countries, and what is called for in "Greenland's icy mountains" will not suit "India's coral strand."

However, as they all need that rich deep effect which velvet alone will give, modifications of quality, price, colour and style have to be introduced to cater for these divergent needs. Furthermore, in some European and Western countries, fiscal and commercial conditions raise barriers, which render foreign competition more serious, and require the study and production of qualities which will compass the defeat of these conditions.

In pre-war times, Germany by reason of an elaborate system of drawbacks and bonuses (though not obviously disclosed as such), manipulated together with her State Railways, and subsidized railway and export

steamers through-rates, was enabled to make use of our own raw material in a dead set at some of our colonial markets from time to time, and frequently could unload in our home markets, open as they were to her by reason of her security behind her own high tariff walls. She could dump surplus production at a fair average profit over her turnover or at any rate reduce her average expenses by an increased turnover. She was not hindered by a certain amount of supineness or lethargy which was also only too evident in some of the branches into which our trade was necessarily divided.

This condition of turning our own raw material against us is, we hope and believe, unlikely to recur, and certainly will not if the various branches of the velvet trade will loyally co-operate with each other for the common good.

Observations on Selling and Distribution, etc. Those concerned in the trade have now realized what can be done if all sections pull well together, and the future of the velvet trade if research and co-operation work hand in hand is a good one.

The climatic conditions of the Manchester district, whilst not favouring it as a holiday centre, help by reason of its humidity in many of the operations of velvet and fustian production, whilst the added skill of generations is available to carry out the details if the guiding brains will keep ahead of the times.

There is much to be done in educating the consuming public as to the qualities of velvet which it will be to their interest to buy, and in creating the organization which will furnish ample supplies of the right qualities, and in making their excellences known to the distributors and the users.

Much harm has been done by the use of qualities ill-adapted to the use to which they have been put,

and the consequent prejudice created in the consumer's mind, when suffering from such unsatisfactory purchase. It cannot be too strongly urged alike on distributor and consumer, that all velvets used for dresses and such garments as will undergo ordinary wear and friction of any sort should be of twill back construction and fast dye. For purposes calling for little wear and no friction, such as various trimmings and lighter ornamentation, qualities of a lesser resistance and therefore of a lower cost, may be employed, and if a high standard of quality for garments is kept up the result to the consumer will always be satisfactory.

Recommendations as to Quality, etc. It may be useful to sum up the conclusions we have arrived at in the course of our consideration of the various phases of velvet manufacture and distribution, and in doing so to point out in a brief fashion the particular points which would recommend the velvet to the intending purchaser, most of which points we have already stressed in the course of these pages. Those improvements which we have followed in previous pages, which have tended to make the article finally lighter, better dyed, and more durable, and have indeed brought it closely on the heels of its expensive relative, silk velvet, have rather tended to make it more difficult for the average purchaser to judge of the various grades of the article.

The first essential of good velvet is that it should be made of good material, and in a proper style of weave. If the material is not good it is impossible to produce the rich, silky lustre, characteristic of the best grades of velvet. The buyer must, therefore, look in the first place at the lustre. Next comes durability, as if not woven in a suitable pattern the velvet pile will not stand the test of wear. The requirements of the world

trade which Manchester supplies, vary as we have seen considerably and cotton velvets are made for all purposes. For some tropical countries, where the native population is not too affluent, the cheapest quality of velvet has to be produced ; a fabric made with some semblance of a pile which can be dyed to the colours most fancied in the particular market. Such qualities are not, however, for countries where appearance, durability, rich deep colour, and bright lustre are the principal desiderata. For such conditions velvet must be woven with a pile which will stand wear, with, for instance, the twilled back, which gives so excellent a combination of softness and hardwearing qualities. It may just serve to recall the fact that these excellent qualities of the twilled back derive from what was at one time known as the Genoa back, a name traced to the time when that ancient Italian seaport led the way in the textile arts.

Velvets intended to stand a reasonable amount of wear, should be made with double warp, although for purposes where comparatively little wear and friction is expected, fairly satisfactory velvets are made with a single warp. By extracting and unravelling a thread one can see for himself whether it is composed of one strand of yarn or of two. Speaking generally, single-warp qualities are not designed for the purpose of dresses, or for whole garments. One of the most durable qualities was the old fast-pile velvet, in which the pile was effectually tied in during weaving—but the durability was bought at the expense of the draping and velvety qualities. The twilled back serves to hold the pile and lends itself to the production of a soft and good draping fabric, as well as to one in which richness and lustre are conspicuous properties.

Nothing is more unsatisfactory to the consumer

than to have an article of which the pile comes out after being worn a very short time, and the blame of this often arises from the fact that the manufacturer of the garments uses a quality quite unsuitable for the wear which it is intended to meet, putting in a quality on its sole recommendation of cheapness without regard to the fact that it must stand the strain of wear. Plain backed qualities, sold unlined, are the cause of this, and the inevitable result is that the customer, ignorant of these facts, feels aggrieved at having been sold a quality which will not give reasonable wear, and having bought this piece of experience she is not willing to take any more risk, and hence the business suffers.

In a velvet employed for trimmings or purposes which do not expose it to friction, a plain back pattern may suffice, but for dresses and garments generally, where friction has to be encountered, it is essential that the security given by the twilled back weave should always be maintained.

The fastness of the dye and its disinclination to rub off and stain lighter coloured materials brought into contact with it, is always one of the main points to observe.

If the foregoing points are observed, a quality of velvet will result representing perfection in cotton pile fabrics and giving pleasure and satisfaction to the users. We may repeat these simple specifications. Well made, twilled back quality, fast dye, rich lustre, soft fine pile; and durability—all of them points which can readily be verified—are the characteristics of a cotton velvet that will give satisfaction to the most discriminating, and make the fabric irresistible to the woman of good taste. These few and simple stipulations have been kept before the reader throughout these pages, and if all concerned in the manufacture and

distribution of velvet will keep them well to the front there will be few dissatisfied customers. The final consumer or wearer can be protected in being assured of these necessary qualities by requiring one of several branded qualities on the market. These brands comprise the points indicated, and the makers of them are experienced in the conditions of wear and appearance which must be satisfied.

As stated, velvet is a material mainly adapted for the temperate zones. Its uses are manifold, and are capable of almost indefinite extension. The climates of the temperate zones of the world render the employment of velvet a suitable fabric for dress material and ornamentation where weather conditions require the wearing of garments with a suitable amount of warmth. Velvet of a reasonably good quality answers this specification. Further, there is living in the temperate zones a collection of people of various nations with means to buy the better qualities of velvets, and as they are generally good spenders, it is amongst them that the large extension in the use of high class velvet may be looked for. At the same time large quantities of the cheaper grades of velvet are used for various styles of adornment in the tropical and sub-tropical countries, but naturally, largely on account of the weight, and to some extent owing to their lesser purchasing power, these countries absorb goods of the lower grades ; tropical Africa, tropical America and the Far Eastern countries all take considerable quantities of the cheaper grades of velvet for various purposes of personal adornment.

A hundred beautiful shades, comprising all the colours of the rainbow are shown on the shade cards of the Manchester velvet merchants, and these are added to and varied according as the latest dictates of Parisian

fashion fix on this colour or on that. Naturally, the darker and more sober tints are in more regular demand for the countries where less vivid colours blend best with the climate and surroundings. Beautiful shades of deep black are produced, and in no department of the many stages through which the cotton velvet of to-day has been evolved has there been more striking improvement than in the production of the rich blue blacks which form a high percentage of the total production of velvets of to-day. For a long time during last century, the Logwood black represented the best that could be produced, but in the later years of last century endeavours to imitate the beautiful bloom of the Lyons silk velvet in cotton met with considerable success, and a steady improvement has been noted in this direction.

Making-up and Boxing. Our velvet piece which we have followed during so many operations since it issued from the loom in its grey state, though now complete and ready for the markets, has still to be put up in the form which renders it ready for sale to the consumer.

After final examination in the merchant's making-up room, it is usually divided into lengths of 25/35 yards, according to the quality and the requirements of the market for which it is intended, folded up or plaited by machinery into the form in which it is usually found best to convert it. After neatly tying up the folded length, ornamenting it with gold bands and braids, and putting handsome labels and tickets on it, it is put into a neatly fitting, suitably coloured cardboard box, bearing the necessary indication of its quality, colour, length, etc., and is then ready for distribution at home, or for packing in the oil-lined, zinc, or tin-lined wooden cases in which it is exported to the countries round the Seven Seas.

Much ingenuity is expended by the best manufacturers of velvets in turning out the boxes and their contents in a manner worthy of their productions. Descriptive stamps and bands are also applied at this stage, in order to guarantee to the eventual consumer the quality of the article supplied. In the case of the wide, high-class velvets, destined for dress purposes of the highest class, it is usual to put the goods up on wooden or cardboard rollers, and then place them in boxes so constructed as to permit of the material being readily unrolled for consumption, and also avoiding the creases and marks which might depreciate the value of the high class fabric. The difficult regulations which many countries now adopt in their Ports of Entry frequently call for special markings and designations to show the origin and composition of the goods, and these are put on at this stage. Elaborate and tasteful pattern cards have frequently to be prepared so that the travellers can display to their customers the goods as they will presently be delivered to them.

Printed Velvets. In addition to the plain dyed fabrics, many attractive styles of printing are applied to velvet : a wide scope of neat, tasteful and handsome designs is constantly shown in printed velvets, in simple and multi-coloured styles. Handsome designs for window curtains are produced in the heavier velveteens and in corduroy. In the lighter dress fabrics acid printing and discharging gives some beautiful effects. Embossed designs give attractiveness to some of the cheaper grades of velvet for export to some of the less advanced markets of different tropical countries. Gold, silver and metal printing is also practised and in some styles with great success and permanence of result.

Some charming soft tones are produced in the corded

velvet or ladies' corduroy : this is suitable for ladies suits, cloaks, coats, etc.

Employment and Uses. The hollow cut velvet, the production of which we have noted when referring to velvet-cutting, gives some most beautiful fabrics for ladies' dresses and suits, and also, more particularly in cream and such colours, for children's garments. In such a colour as cream, a velvet pile of this sort can readily be washed if a few simple instructions are followed. One outstanding advantage of this article for children's use is that it can be washed repeatedly without shrinkage, loss of colour, and without that yellowing which develops in woollen fabrics under similar conditions. Also it is a joy to the mother or nurse as the garment requires to be merely hung up after washing, and no mangling or ironing is required. When dry, if carefully washed and not squeezed during the process, it is fresh and new, and cannot be distinguished from material fresh from the merchant. These qualities also render it a useful garment for summer sports skirts for ladies.

Velvet has been used in quantities for slippers, for export and to some extent for home use. In high-class shoes, good velvet has been employed with great success, turning out articles of the choicest fashion.

For boys' and juvenile suits, velvet is employed with much success, and if only sufficient discretion is used in the material employed, the wearers, or perhaps one might say those who find the money for the suits, will always get much satisfaction from these articles. Particularly do the finer ribs of corduroy in reasonably good qualities lend themselves to the hard wear which juveniles take out of their clothing.

Velvet has been very largely employed in its time for velvet dress bindings and trimmings of that character. Velvet ribbons have been made with much

success and at economical figures for a long time, and for countries where the economic position counts more than any other velvet ribbons lend themselves as very suitable articles of adornment.

In the coming time there is ample room for a very large extension for velvet as an article of general wear in various directions. With a clearer common understanding amongst the various branches engaged in producing the article, and a co-ordination of their efforts, there is undoubtedly a wider prospect than ever before for this fabric. Velvet has been gradually coming into its own as a suitable dress fabric, but for the large extension which certainly can be effected much spacious work will need to be done—but a reasonable measure of co-operation amongst the various interests involved would very certainly result in an ample return to all those engaged in the industry.

If suitable qualities are used its uses for dress purposes are legion, and its special characteristics mark it out, as we have seen they did in Roman and Mediaeval times, for all purposes of ceremonial and show. For the everyday and workaday world qualities of velvet and corduroy are produced which will give their wearers unbounded satisfaction combined with personal embellishment. We are dealing with corduroy in another chapter, so our main purpose here is to survey the lighter material. Velvet for hats is in perennial favour, for boots and shoes it has been demonstrated that if suitably made the most fastidious can be shod in the best taste with this material. Ribbons made of cotton velvet are creating a place for themselves, especially in those markets where economic conditions require frugal buying.

Figured and printed velvets in some of the choicest effects are produced, and the effect of pile gives variety

to tones and colouring far beyond the scope of plain fabrics.

In the important region of house adornment and decoration velvet has a wide field, and for such employment as sound deadener in rapid means of locomotion and the upholstery of vehicles velvet has its particular suitability.

CHAPTER IX

CORDUROY, MOLESKIN AND KINDRED ARTICLES

Corduroy. We may now pass to the consideration of the heavier side of the cotton pile goods categories. Corduroy, or cord, as an important member of the fustian family, has been frequently referred to in these pages, and we will now follow up that branch in more detail. Its name is probably of English invention, although it has been surmised to be of French origin—*Corde du Roi*, King's Cord. There is nothing to support this suggestion, but the article has been known since the eighteenth century, and perhaps earlier. Fustian, as embracing all branches, was known in mediaeval times as we have seen, but corduroy has, of the heavier fabrics, probably secured a larger clientele the world over than has the fustian proper as now understood.

Corduroy may be described superficially as velvet woven into ribs or stripes. Of these there is a wide variety, ranging from the fine thicksett rib, a fine ribbed quality where sometimes we find twelve ribs to the inch, through the various larger ribs known as 9 shaft or fine reed, whip cord, 8 shaft, Genoa, up to the constitutional and cable cord, of which the latter may even measure the greater part of an inch for a single rib. Within these limits are all sorts of variations, grouped in various qualities and weights. The Doncaster, striped, Algoa, partridge and other fancy variations from the plain cord crop up from time to time. Fustian, if we now use this in its narrower sense as a group and not a class, covers the plain textures without pile, but woven with a real or simulated pile weave (though usually not cut as in the case of velvets),

such as beaverteens and moleskins. These again are allied to imperials, fiveshafts, satintops, cantoons, diagonals, etc., of the same family, but they are not woven to a pattern which allows of the pile being cut. The usual method of dyeing and finishing these plain fabrics is to raise and then shear them, so that there is a sort of pile on them in many cases. This, as we saw in the early history of fustians, was one of the original modes of preparing these textiles. The wear of these uncut fabrics is enormous—the good ones will wear like leather, and if suitably finished, as the old "self" moleskin, they would stand the rough wear of the blacksmith and the riveter, even turning sparks aside without suffering injury. As widely divergent needs as those of the bookbinder and the hunting field are filled by types of moleskin, and in the latter a rival to pigskin can be furnished by the patent beaverteen, suitably bleached, dyed and finished without sizing or dressing. But it is with corduroy that the chief development lies. Its users include the farm labourer of rural England, the tunnel worker of Piedmont, the Continental sportsman *pour la chasse*, the South African farmer, the Australian stockman, the constructions gangs of North America, and the cattle riders and the lumber jacks of the Western Continent. The hunting field and Alpine sports add to the list. The great utility of corduroy and fustian was demonstrated during the war, when British and Allied labour battalions and forestry gangs, as well as the Mounted Cavalry, were all clothed in this workaday material.

Unfortunately for British trade, the manufacture of corduroys is one which by the aid of high tariffs, several European countries and the United States of America have, in the past generation, been able to initiate and carry to a reasonable perfection, and the competition

of the home-made articles has in these and one or two other markets made it difficult, if not impossible, to sell the British article against them. France was formerly a very important outlet for Manchester cords, but the final abrogation of the Cobden Treaty and the imposition of a very heavy specific duty, has practically closed France to Manchester corduroys for some time. The looms of Ghent, now working once more, have reduced the consumption of our cords in Belgium to a small item. Holland supports a domestic industry, as do Italy and Spain, and all of them impose a relatively serious import duty on British productions. The hey-day of the corduroy industry in the Home Trade passed with the older prosperity of the agricultural interests in the middle decades of the nineteenth century, as in these more democratic days, fustian is not looked on with the favour which commended it to the more docile rural labourers of the past era.

Possibly the deterioration which certain qualities underwent in the stress of competition may have aided the process. Corduroy and fustian must be made of good sound material to give reliable wear to the user, and the filling up of poor qualities with bone size and other ingredients to impart a specious appearance of quality and a deceptive touch of weight to the fabric, aided its disfavour. This filling up with bone size, besides giving a spurious appearance of quality, produced the old objectionable stink which so long characterized the fustian fabric and detracted from its merits. Its sterling qualities, when made of good material, are not to be gainsaid, and when no fillings are put in, no fabric can be found to stand the hard and honest wear of a good quality of corduroy. All the same, the trend of socio-political evolution in this country has worked against the extending use of corduroy.

To discuss the manufacture in more detail, the same interests and groups which are concerned in the manufacture of velvet are in the main connected with corduroy manufacture. The material employed is mainly good class American cotton, and the spinning and preparation is carried out in much the same way as dealt with in the chapter on Velvet yarns, with this important difference, however, that as we are dealing with goods of a much heavier, stouter quality, the counts of yarn are much coarser. It must be remembered that corduroys are destined in the main for men's wear, and for pursuits and occupations in which hard wear is the first objective, whilst velvets mainly used for woman's dress and adornment are designed for their sightliness and attractive appearance, combined with good draping qualities.

Hence in corduroys and fustians we find the use of warp and weft yarns of approximately double the thickness and strength of those employed in the manufacture of velvets, and the presence of three-fold yarn for the warp is constantly in evidence, whilst two-ply double yarn is largely employed. According to the grade of corduroy an average count of 20/24 weft, with a two-fold 24's warp, would be a good combination, or for a particularly durable article 16/20 weft with three-fold 24's warp might suitably be employed.

The quality of cotton in these yarns must be good, say, good middling Texas, and of good staple $1\frac{1}{8}$ ins. long. A good wearing quality of corduroy would be produced from a 31 in. fine reed, of 12 oz. weight to the yard, finishing 27/8 ins. wide, or for a broader rib a 31 in. Genoa rib, 13 or 14 ozs. to the yard, to be finished the conventional 27/8 ins. wide. Either of these if made of good material, finished without any excessive amount of bone size or similar

filling, would give satisfaction to the wearer of the garments.

The Americans have in the last few years made a considerable advance in the production of corduroy, and are now popularizing the use of it amongst all classes of workers whose occupations call for hard out-of-door work, but a *sine quâ non* is that the qualities should be odourless and not filled up with a quantity of evil smelling sizes and dressings. This is an example we might copy for our corduroy and fustian productions. There is no doubt that we have much improved in our methods of manufacturing these goods in the last generation, as earlier last century fustian as a whole was associated with evil smells which might even be briefly and appropriately described by the word "stink." A still further improvement in this direction will benefit the whole trade.

Of course, the higher grade qualities have always been free from this reproach, and in these, ideal qualities would be—

Fine rib— 16 oz. Thicksett.

Medium rib— 16 oz. Fine Reed.

Broad rib— 17 oz. Genoa.

made with three-fold 24's. warp and 16/24's weft, and of good staple $1\frac{1}{8}$ in. cotton.

Qualities of this class could be sold with utmost confidence for all users of better class garments, and the wear and service obtainable from them would be unapproached by any other textile.

For hunting breeches a beaverteen 17/20 ozs. to the yard, with a three-fold warp and of 16/20 counts weft, would be first class. A quality of this type finished in the weighted finish of a self moleskin would be admirable for the hardest work, such as shipbuilding, engineering and ironworkers, or for farriers' aprons and

similar uses, etc., as in addition to endless wear it would be immune from sparks through its dressing.

The looms employed in weaving fustians do not differ materially from those referred to in Chapter IV on Velvets, and the cycle of operation is much the same, though, as we have seen, the diagram or weaving pattern differs in detail from that which produced a velvet.

By way of preparation it is usual to card or scratch the back of corduroys in order to produce a soft woolly nap, and give a kind, clothy feel to the finished article (operation known as "perching"). Otherwise this would have a thin papery feel, as the stiffening or dressing which has to be introduced in order to give this thick and clothy feel would not be easily absorbed unless this soft woolly back was created to soak it up like a sponge. Some very ingenious raising or backing machines have been developed to produce the short, soft back nap required. The cutting requires as preparation, stiffening, liming, and in some cases soaping, but is in nearly all cases effected by machinery, though the cutting machines are different from the velvet cutting machine already described. Indeed, the cutting of corduroys by hand may be said to be almost extinct—differing from velvet cutting in this respect. The machine which for a long time has done a large portion of Manchester cord-cutting is the Smith machine, and in this method, mainly adapted to the medium and broader ribs, the entire piece is cut at one operation.

Smith Cord-Cutting Machine. Although many attempts have been made by inventors to substitute machinery for hand labour, the George Smith corduroy cutting machine was the first really successful machine in the field for the cutting of cotton pile fabrics. It differs from other pile-cutting machines in that it consists of

an individual circular knife for each rib right across the piece. The entire piece is in almost all cases cut at once, right through from end to end, every rib being cut at the same time. In practice there are occasional exceptions to this—when the machine is set to cut very fine ribs, and then sometimes the piece has to be cut at twice. The knives are circular, about $2\frac{1}{2}$ ins. in diameter, and are carried on a shaft so that it is necessary to set these knives in position for various widths of rib. For purposes of comparison one might consider them as so many tiny little circular saws set side by side ; the change in the setting to enable the machine to cut a different style of rib, whilst appearing to be something of a difficulty, does not in practice occupy more than half an hour, and once the machine is set, its running is continuous, in an ordinary middle-class rib it will cut a piece of 110 yards in an hour and a quarter, and in an average working day would probably cut half a dozen such pieces—say, something round about 700 yards in a working day. The general characteristics of the machine are shown in the accompanying illustration, Fig. 12. (See page 94).

The cloth is taken in the lap just as it comes either from the warehouse, from the merchant's grey room, or from the percher (the man who raises the woolly back on the piece), and is then led over wooden rollers to keep it taut, and then over rollers covered with pins which hold the cloth out and keep it firmly set. The cloth travels in the direction of the knives ; each knife is provided with a guide which enters the cloth in the rib or tunnel forming the pile, and as the cloth travels along the guide follows the course of the rib. The guides are each formed with slots into which the knife enters, so that as the pile presents itself the knife severs it in a manner which will be readily understood. In order

to give freedom to the knives and guides, and to allow them to move in a lateral direction, they are mounted loosely on the shaft that carries them, but are caused to rotate by means of keys which enter a slotted key-way. As the cloth proceeds the guides receive a forward movement, and this movement takes place intermittently, being obtained from a series of hammers actuated by cams. The cams are so set as to cause the slotted guides to move alternately and they work in group form, four, five, six, or seven at a time, one leading and the remaining four following in their respective order. The object of this motion is to remove the strain that would be put upon the cloth were they to move simultaneously. The cloth, after being cut, passes forward and is wound round a roller ready for the subsequent processes preparatory for dyeing.

An important feature about this machine is its high productive capacity, which is due to the fact that the whole width of the cloth is operated on at once. On an average this machine would cut as much cloth in a day as a hand-cutter would turn out in the old fashion in a week. The character of the cutting is very good, as obviously if the knives are accurately set they will just cut the crown of the pile in the rib for which each knife is set. One great advantage of this machine is that it cannot easily make holes, as it is supplied with an automatic stopper, and provided this is in good working order immediately the guide comes to a hole or defect, it drops out and automatically stops the machine. In comparison with the old method of hand-cutting, this continuous running of the piece from the beginning to the end avoids all the difficulties of the settings-in, which are inherent in hand production. Also it may be pointed out that the goods cut in this manner do not require stiffening, and an obvious

advantage in cutting all the piece at once will make it clear that defects usually associated with the edging of the knife cannot occur in this machine.

Having been in use for practically half a century, it is a well-known piece of fustian mechanism, and

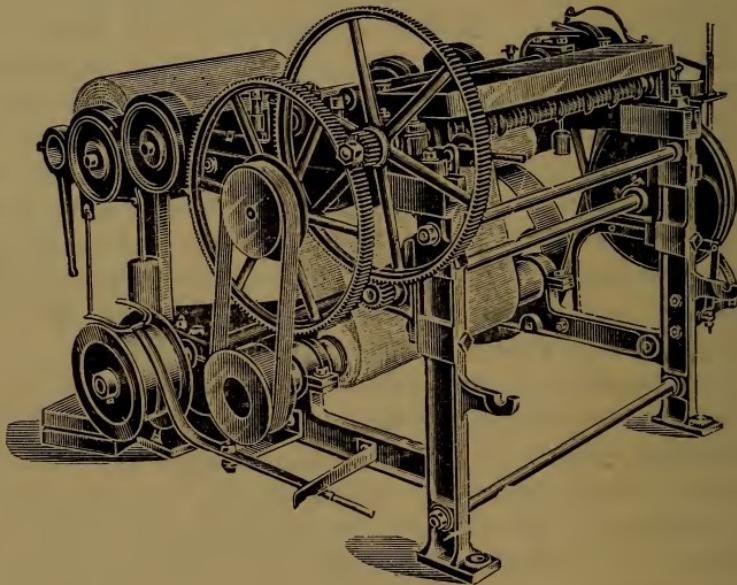


FIG. 12

GEO. SMITH'S IMPROVED FUSTIAN CUTTING
MACHINE

has been extensively adopted in the manufacture of corduroys, not only in this country but in several Continental countries — France, Belgium, Spain, Germany, Russia, and the United States of America.

Netherwood Cord-Cutting Machine. As we have seen the original cutting machine of this type (Keighley and Netherwood) was made for the cord business and was employed in the manufacture of cotton cords,

and substantially the same type of machine, whether of the single-knife type (similar to the velvet machine already described) or of the four-knife type in which four knives work side by side, continues to be employed successfully in the manufacture of cotton cords. The velvet-cutting machine, important though it now is, may indeed be said to have been an off-shoot from the original invention. An outstanding feature of this machine is that it can be employed to cut the very finest ribs of cord as well as the medium and broader.

Dyeing. A large portion of the dyeing of corduroys is done in the valleys of the Pennines, on or over the Yorkshire border. Some of these dyeworks in the earlier times had the advantage of water power for running the machinery, but this has been supplemented or replaced by steam in these times. Apart from the motive power, a good supply of water, and good water for dyeing, was also an attraction, and where an industry is localized it attracts similar industries. Manchester retains its share of the work, but it is of a rather different class.

The speciality of the Yorkshire work at one time was the increased curl or "cockle" which the water gave to the ribs of some qualities, but that point is not now sought after as much as formerly, and some spurious imitations have destroyed its value as a touchstone of quality.

In the Bedford cord we have also a fabric with a considerable history, dating back probably to the eighteenth century. Here the cord, rib or stripe is woven in a manner which throws the pattern on to the face, but dispenses with the binding (and frequently floating) picks, which form corduroy of the recognized designs. Consequently, Bedford cord presents no tunnel or races which can be cut. This material, like the cut

cords of anything beyond the lower sorts, gives excellent wearing results, though from the nature of the weave it is generally less supple and clothy to the touch than is corduroy with recognized ribs of pile. For utility riding breeches and similar employments, Bedford cord furnishes excellent results, offering a style and smartness in rib specially suited to garments of this class.

In the sphere of the motor car, Bedford cords in suitable colours, or printed in small neat patterns, offer an interesting fabric to the designer who has to consider economy combined with a pleasing and fairly durable effect. The great growth of the motor industry certainly offers a wide field for the employment of any class of corduroy upholstery in vehicles, to meet the necessities of that enormous clientele which has still to be catered for in the motorist of moderate means. The wearing powers of any of these fabrics would certainly rival any of the cheap materials in use in these economy cars.

Other Fustian Sorts—

- | | | |
|------------------|----------------|----------------|
| 1. Corduroy. | 5. Beaverteen. | 9. Satintop. |
| 2. Bedford cord. | 6. Barracan. | 10. Lambskin. |
| 3. Fustian. | 7. Imperial. | 11. Swansdown. |
| 4. Moleskin. | 8. Fiveshaft. | 12. Velskin. |

Fustian, as we have seen, is the older designation covering practically all the heavier classes of pile goods, and was the well-known name of whatever was understood in this class from mediaeval times. It actually does resolve itself into a number of kindred fabrics of rather different character and designed for different purposes. One of the principal subdivisions is that of corduroy, treated in detail elsewhere.

Taking the fourth heading—Moleskins, perhaps to some extent recognizable as textile imitations of the

skin of the blind burrower, like all other fustians, comprise a raised nap on the face (ordinarily produced by the process of fustian cutting) from which the surplus hairiness is cropped or shorn off, leaving a close, short nap. This process is referred to in the earliest records of fustian manufactures, when fustian shearing was a well-established branch of the business. When dyed in the shades of drab, grey, fawn, and such colours, the effect produced by this method of finishing is very similar to that of the natural skin.

Beaverteen and Imperial are names of fabrics perhaps in these times more generally understood as fustians, and may be summed up as being in the former case woven on a pattern, forming a tunnel or race as in velvet or velveteen but remaining uncut, and sometimes not cuttable, though preserving this particular style of weave as giving the durability, suppleness and long wearing qualities which distinguish these fabrics.

The Fiveshaft and Satintop are described from the weaver's point of view by these trade names, and may be roughly classed as moleskin.

Printed moleskins have had in their time a widely extended use, but here again, unfortunately, the pressure of hostile tariffs, which we have to notice so often, due to the desire of some of the less developed foreign countries to extend their own domestic manufactures, has resulted in customs tariffs being applied to textiles like printed moleskin, which have in the course of time gradually strangled the export trade of this excellent fabric.

Unfortunately the construction of moleskin is of a character which permits of it being imitated by the less advanced countries as the yarns employed are not of that fineness and regularity essential in the production of good class velvets—consequently foreign competition,

combined with adverse tariff legislation designed to exclude those qualities which the levying country can more easily produce, has hit the printed moleskin trade pretty hard.

All these sorts, fustian, beaverteen, imperial, etc., have been printed in many varieties of patterns, and in many such patterns they give a satisfactory imitation of woollen styles and tweeds.

One of the main recommendations of the fustian group is that whether dyed, printed, or otherwise finished, the article retains its durable characteristics, and the better qualities give wear which is almost everlasting.

The excellences of high-class beaverteen for the requirements of the hunting field are well-known to the West End riding breeches maker. The stockmen and riders of the Australian plains, needing a real utility article for their daily work, found it in Self or Miller's moleskin, made out of beaverteen, frequently called O'Neill's Patent Beaverteen, finished in its natural colour and filled with a certain amount of heavy size or china clay, giving an appearance of weight and durability to the garment.

Imperial, fiveshafts and satintops are frequently converted into lambskins and swansdowns, both grey, white and dyed colours, by producing a very long nap on these qualities, and the names of lambskin and swansdown well describe the effects of the long, woolly down produced. Their employment for many subsidiary purposes where a soft, kindly texture is required is almost legion.

Velskin. In the last few years an important extension of this branch has grown up in the so-called "Velours" cloth or velskin, where a very close, fine, velvety pile has been produced in imperials, etc., by a special

process of raising, and so well is this performed that in the better qualities the effect of velvet pile is well imitated. There has been a great extension of this article in the millinery trade, and the style has shown itself well suited to hats of all sorts. Heavier qualities of this class of "velours" finish have been used with great advantage for children's gaiters, and the shoe trade has employed the article to produce slippers and shoes in imitation of suede leathers. There is no doubt an important outlet to be created for well finished goods of this class of fabric, where the effect of pile can be well reproduced.

It may now be desirable to review the various qualities of velvets which we have traced through the processes of production. They may be roughly divided into three classes, the low grade, medium grade, and good quality velvet.

Generally speaking, the low grade velvets are those of the narrower widths from 17 ins. or 18 ins. up to 22 ins., and occasionally they are made in wider widths for special purposes, such as 31 ins. or 32 ins. To take the low grade—some of these are used for various manufacturing purposes for home trade articles of minor adornment, such as cheap show cases, photo frames, common slippers, jewellery cases, etc., and in some cases for the lower end of the millinery trade, but generally speaking most of these low qualities are exported. Many of them go to Eastern Europe in the countries round the Levant, tropical Africa, tropical South America, some parts of the East Indies, both British and Dutch, and to some parts of China and Japan, and many of the minor markets where for climatic or for economic reasons the purchasers are unable to buy good qualities.

The medium grades of velvet are not much sold

in the narrowest widths ; probably the bulk of them are used in widths of 22 ins. and sometimes rather wider, 24 ins. and 27 ins. They are used for many purposes in these islands, and practically all the rest of the world. Their general employment is for trimmings, and such portion of garments as do not need hard wear. Some qualities of this sort are very slightly, and the aim is generally to produce a good appearance, without having regard to durability or the wear of the fabric. Goods of this character are exported largely to all the European markets, and are sent to pretty nearly all the countries overseas.

When we come to the better grades, we deal generally with the wider widths. Most, if not all these better grades, are made in the twill back, and here it becomes not only a question of appearance, but of durability and wear generally. A large business is done in the narrower goods of this grade, the popular article being the 22 in. twill back, which is sold at a price admitting of a very extended use. This is very largely employed in the home trade, but the home trade also makes use of a number of better class qualities, running from 24 ins. to 27 ins., and even wider widths, and for the very high class outlets in the home trade goods of 42 ins. and 44 ins. are often employed. Similarly goods of this class are much used in France and also in Spain, whilst Holland and the Scandinavian markets, Italy, Switzerland and nearly all the other European countries take their quota of these good class qualities.

Many of the qualities in this category are of the highest excellence, and are to be found in the best shops in the West End of London, in the choicest stores in Paris, and in other capitals in Europe.

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CHAPTER X

OUTLETS

Markets and Tariffs. At times the United States is a large user of first-rate qualities, but there, as in several countries in the temperate zone, where there are large consuming centres with a population of considerable buying capacity, the import tariffs are so scaled that it is at times very difficult to export English velvets, even of this high class, to those countries.

The general tendency of most of the important countries which are at all industrial is to gradually increase their tariffs on importations of goods of this class from England, and velvets are being hit harder and harder under successive tariff revisions in countries which otherwise would be large consumers of British productions.

This question of the import tariffs is of the highest importance to Manchester velvet manufacturers, and it is difficult to know what policy can be adopted which will counteract the ever-increasing burden which these tariffs impose upon Manchester manufacturers. An important market like France has its buying capacity from time to time much reduced by the onerous nature of the tariffs which the fiscal policy of the French Republic imposes on British velvets. In the latter years of the war the already high tariff was trebled, and at the present time the average duty on a yard of British velvet imported into France may be roughly put at 2 francs or even more, a percentage of the actual English value of the goods "at the works" of something over 20 per cent. At this moment the French Customs

department contemplates, if it has not already applied, a tariff amounting to five times the pre-war duty.

Similarly, in the United States of America, the tariff has ruled at almost as much as the goods themselves, and is probably now about 60 per cent of their value when they leave here. In both these cases the tariff is imposed in the interests of the domestic manufacturers, and it is by the aid of these tariffs that the home industry has been built up in cities like Amiens, France, or Providence, Rhode Island, in the United States.

In a somewhat similar degree high tariffs rule in Spain, where they are imposed in the interests of the Barcelona manufacturers, and even now a determined effort is being made on their behalf to increase the already high duties on goods entering into Spain. Italy has a fairly high tariff, but so far the Italian manufacturer has not been able to make the finer grades of velvet successfully. Belgium, too, imposes a considerable tariff, Holland, on the other hand, approximates more nearly to a Free Trade country, as do some of the Scandinavian countries, where neither Denmark, Norway or Sweden impose tariffs of such an onerous character as do other European countries.

The British Dominions generally—Canada, Australasia and the South African Dominions—are considerable users of English velvets, and some of the minor British Possessions also use quantities, and generally speaking there is a preferential tariff in favour of British production.

As we have seen on previous pages, some of the British Dependencies in tropical countries do use at times quantities of the cheaper grades, but the purchasing power in those markets is very limited, unless the prices are ruling very low.

On the question of foreign tariffs, it is interesting to

note what has taken place in the exportation of the heavier grades, such as men's corduroys, into many of these near European countries. From the time of the arrangement of the Cobden Treaty in 1863, for the remainder of the nineteenth century, a large and growing trade in corduroys was done in France, as the article is one eminently suitable for the use of the French peasant and farmer class : but the desire of the French manufacturers at Amiens, and elsewhere, to share in this business caused a gradual increase in the tariff to be made with the successive renewals of this Treaty, until at last the final denunciation of the arrangement cut off entirely what at one time was a very important outlet for British corduroys, but had gradually diminished under the pressure of the tariff. Now the market is nil.

Something like the same process has been going on in Belgium where in favour of the manufacturers of Ghent the tariff wall has gradually been built up. In Holland also the Dutch Government has an eye on the interests of the native Dutch manufacturers, and the prosperity of Enschede has been built up at the expense of Manchester. Barcelona, in Spain, has long been a producer of corduroys, and the Spanish tariff has been drawn so as to carefully guard the interests of the manufacturers of that city. Italy also is a diminished market for men's corduroys, due to the fostering of the Italian manufacturers. Apart from Germany, where the tariff has always been pretty high both on velvets and men's cords, and where an important manufacture has been built up in both these articles by them in Berlin, Hanover and elsewhere, the minor markets of Eastern Europe furnish a considerable outlet for Manchester productions, both velvets and corduroys.

At one time, the people of South Africa were very

large consumers of corduroys of various grades, as were the stockmen of the Australian Continent.

Corduroys, Moleskins or Fustians. The uses of these all round fabrics of utility are manifold.

In the nineteenth century workers of all sorts who had to perform hard manual labour almost invariably wore cord or moleskin garments. In the early days of canal and railroad making the "navigator," that is the man who did the heavy digging and shovelling, now called a "navvy," invariably wore one or other of these hard wearing fabrics.

Even now, railway porters' uniforms are in many cases made of corduroy, and occasionally of moleskin, but the tendency of these democratic days causes the replacement of cheap or more dressy looking woollen or shoddy fabrics for the genuine and better wearing, if more workaday-looking, corduroy and fustian.

Rural and agricultural England, off the beaten track and away from the busy throng of cities, still sticks to the homely and serviceable corduroy, and in the remoter country-side the gamekeeper and small farmer are still to be met with in their ample pocketed velveteen coats and serviceable corduroy breeches.

For heavy work like that of blacksmiths, ship-builders, riveters, wheelwrights, etc., some of the heavy moleskin and fustian fabrics with an ample dressing or stiffening of, say, China clay, are ideal for their work, as these strong fabrics, suitably filled, are not only wear-resisting, but will turn the showers of sparks incidental to their daily occupations.

Manufacturers of printing machinery, etc., have found in moleskin a splendid fabric for covering some of their printing rollers and standing up to this difficult work ; whilst in trades as diverse as brick-making

have the brick manufacturers found moleskin a useful accessory to some of their plant.

Corduroys, Moleskins and Fustian Outlets. A striking illustration of the value of this general utility fabric was furnished during the war when the Government was in a corner to discover some means of fitting out its labour battalions with something which would stand the trying winter conditions of toil and labour in the mud and filth of the Western Front in France and Flanders. Good advisers put them on to corduroy, and they called on Manchester manufacturers to supply their urgent needs. A prompt response was made to the Government's rather frantic calls with a result that the labour battalions of most of the armies were clothed in this useful fabric. Happily, the British Government in this case set the example in utilizing a really sound combination of corduroy, and the quality was made up of very good material and of sufficient weight, and was wisely finished almost without any dressing at all, so the consequence was that the resulting article would practically wear for ever.

The Dutch farmers at the Cape were, during the last century, also faithful users of corduroy, the Thicksetts were quite a line in the trade, and in the tan brown shade, then affected for this trade, there was at its heyday an enormous business done with that distant dependency. But the Dutch Cape farmers, too, have had their tastes turned in other directions, and they no longer take the quantities which they formerly absorbed.

The Australian stockmen found that there was nothing like Self White Moleskin, when they had to spend days and days in the saddle, but they, too, have turned their attention in other directions, and the trade in that Island Continent for Self White Moleskins is now not what it was last century.

Much of the enormous mileage of railroad line in North America has been built by workmen wearing corduroys, and the constructional gangs of British North America in the busy period prior to the war were largely clothed in this material.

The frugal French peasant and farmer uses corduroy for both his workaday and holiday attire, and prior to the denunciation after its final renewal of the famous Cobden Treaty towards the end of last century, large quantities of this material were sent from Manchester. The hard working Belgian cultivator and the agriculturists of Lombardy and Piedmont still stick to this excellent fabric, and even the natives of tropical Africa have found that corduroy meets their needs best.

Turning to the matter of house adornment and upholstery, very much has been done in recent times in extending the use of both velvets and corduroys. Some of the choicest designs and colourings are to be seen in the high class printed velvets which are now turned out by several firms in this country—hand printed by block printing as the best of them are, in tasteful designs and with this new addition of non-fading added to the attraction of these beautiful and durable colours there is no material more calculated to embellish the home than printed corduroy. As a variation from the plain dyed material, the beautiful and durable colours employed in high class printed velvet, especially the block printed work, render it a material than which nothing can more tastefully adorn the home.

Corduroys can be seen on many suites of furniture both in plain or tasteful printed designs, and nothing will give better wear and greater satisfaction to the users than a good quality corduroy for purposes like these.

Non-fading Dyes. In addition to the fast dye—i.e. “fast to rubbing,” which has been a feature in the good class pile fabrics, both of velvet and corduroy, there has been a strong desire to produce a dye which shall combine with the other necessary stipulations, a quality to ensure the colours lasting well when exposed to the influence of strong sunlight or other severe conditions.

It is now possible to produce this unfadable dye in a number of the most current and useful shades, either in corduroy or in furniture velvet. The effect of this on the subsequent manufacturers of furniture must be most considerable, as none of them can afford to employ materials in their furniture manufacturing of which the colours will not stand the test of reasonable exposure. Inevitably, therefore, the production of corduroy and other Manchester pile fabrics must tend towards these new “non-fading” colours, to the satisfaction of the consumer.

In many countries the hard wear required of railway carriage upholstery is catered for by corduroys. Let us hope that the railway managers of Great Britain in the new era of railroad management will realize what a splendid home produced fabric they have at hand in corduroy.

Progressive constructors of good class motor carriages have realized what an excellent fabric is at hand, for an up-to-date design.

Aeroplane constructors have realized some of the advantages of corduroy.

In the last few years a great vogue has grown up for an imitation of velvet with a very short nap or pile, such an article as would show no divisions but a mass of pile, not to be turned over, as can be done in the case of velvet, by bending the article backwards

and showing a back uncovered, as is possible in some of the cheaper grades of velvet. To produce this simulated pile very persistent efforts have been made in order to weave a fabric which shall in its subsequent processes produce the simulation of pile.

This has been very successfully done in the velskin or velours, and the millinery trade has employed large quantities of this fabric. Variations of it have been used for gaiters and even for shoes, and they too have made their appearance and look very slightly. In the suède finish this product is indistinguishable from high-class fine leather.

From this glance over the uses to which velvet, corduroys, velskin, and their respective allies can be turned, it will be evident that in almost every branch of clothing and textile adornment velvet in some shape can be made use of.

CHAPTER XI

GENERAL DEDUCTIONS

General Deductions. We have now taken a general survey of this ancient Manchester trade, dealing as generally with the various sub-divisions as the scope of the work will permit. We have seen that it is a manufacture and trade of considerable complexity and detail, and during its evolution from the small beginnings of the pre-mechanical age, it has developed along lines which have made each of the branches specialists in their own departments.

It is always difficult to forecast the future, especially in times of uncertainty like those we now live in. There arise, however, a few points which are of interest in any endeavour we may make to see into the future.

The first is the obvious necessity of closer co-operation between the various subdivisions into which the velvet trade has resolved itself. A trade like this will always depend upon individual initiative to find out better ways of doing things, but there are many ways which will occur to those thinking about the future of the industry in which economy and efficiency can be furthered by intelligent co-operation between the various sections. It must be remembered that of the production of cotton pile fabrics, it is estimated that 80 per cent goes overseas, and the 20 per cent which the home country consumes would obviously not suffice for the capital and labour concerned.

In pre-war times foreign competition, particularly that of Germany, which through its ingenious arrangement of rebates might almost be said to be state-aided,

made heavy inroads on this 80 per cent, and even, during hard times, into the 20 per cent of our own home markets.

During the long years of war this was the only European country which could produce cotton pile goods, and these not always of the best quality, dye and finish, and during that time the high standard of quality did obviously depreciate. One essential which must not be overlooked, is the necessity of getting back to the pre-war standard of excellence in every department. The easy money period, the waiting list of orders, the inquiries from everywhere, accepting almost any price and any distant delivery, have brought about a disposition to expect that this Golden Age would endure for a long time. From this there has been a rude awakening, and we must now realize that the future depends on our efforts to produce the best of every article in a manner not to be excelled, and at a price not to be beaten by any of our foreign competitors.

The manufacturers of the United States who, under the shelter of a high tariff wall, have been able to hold us excluded from their own great home market on many lines, have recently made great efforts to export and have tried to capture the adjacent Canadian market.

To Secure Economy. The question of economy has the closest bearing on this cheapening of production and ability to meet and vanquish foreign competition. This opens up very far-reaching questions. On economy depends cheaper production. There may be economy produced by a carefully considered pooling of interests, where pooling could be carried out without detracting from efficiency. It certainly would effect many economies in management, staffs, selling forces, etc. It would make it clear that the measures for restricting imports in certain lines from abroad may have an adverse effect on the costs of dyeing materials—an absolutely

necessary item, when it is considered what excellent dyeing chemists the Germans have been for some time.

The restriction of imports would mean that we should be penalizing ourselves in competition for the 80 per cent of our total trade, represented by our exports, as we should be making ourselves pay a considerably advanced cost for those necessary dyeing materials which we must still obtain from Germany. Non-interference with certain imports seems as important an item for the velvet trade as for certain other branches of the cotton trade.

Another very important point for the future is the question of proclaiming the excellent points about velvets produced in Lancashire to the rest of the world. The propaganda necessary to the skilful and persistent assertion of what Lancashire can do in cotton velvet production might well form one of the earliest planks or platforms, which a general co-operation of the various sections of the velvet trade could well put on a sound working basis immediately. This would probably lead to improved and more economical methods of marketing the production of the velvet trade, and it is certainly one of the directions in which co-operation would undoubtedly help us.

Finally, there comes the question of research work. In a trade of the complexity of the velvet trade there are always cropping up questions of difficulty in regard to the just responsibility of faults, damages, imperfections, etc. In a non-cohesive whole there is a disposition to push the blame on to some other section of the trade, to take up a "non-possumus" attitude, to evade the issue, rather than look at the broad general line that it is in the interest of the whole trade that such difficulties or problems should be explored with a view

to settling and eliminating them entirely. Combination in research would get at the causes and assist in their removal. This is an ideal in which, in the interests of all, we should persevere. It is sincerely to be hoped that some of these very desirable aids to economy and efficiency may be brought to early fruition.

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